

MONTHLY WEATHER REVIEW,

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(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to October 14th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 157 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means 133 and 132 respectively, from the former; reports from 29 Sunset stations; 249 monthly registers from Voluntary Observers; 52 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Service of, Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon chart No. II is shown by the isobaric lines the general distribution of atmospheric pressure, as reduced to the sea level, for the month. The variations from the average pressure for the past seven years have been marked and general. East of the Mississippi river the pressure has been decidedly in excess save in the Gulf States. The excess in New England has ranged from 0.04 inch to 0.08 inch, except on Mount Washington, where it was 0.11. The greatest excess was in the Middle Atlantic States and the Lower Lake region, where it varied only from 0.09 inch to 0.11 inch. The deficiencies have been greatest in the Red River of the North valley, ranging from 0.08 to 0.11 inch, and in southern Florida from 0.04 to 0.06 inch. Deficiencies are reported in the Plateau District from Salt Lake of 0.03 inch, and from Virginia City of 0.04 inch, these being the only stations therein with seven years means. On the Pacific coast the pressure at San Deigo was normal, at San Francisco 0.01 inch in excess, and at Portland there was a deficiency of 0.035 inch.

The Local Barometric Ranges have been greatest in New England, over which section the severest storms of the month have passed. The ranges in that district have been unusually great, ranging from 1.38 inch at New Haven to 1.85 inch at Eastport. The range elsewhere of one inch and over includes the Middle Atlantic States, the Lake region, the Northwest, the Lower Missouri valley, North Carolina, the greater part of the Ohio valley, the Mississippi valley from Keokuk northward, and the Northern Plateau district. The range of 0.75 inch and below includes in its limits ten Gulf stations, the southern half of Texas and Georgia, the Southern Plateau district and southern California. The only ranges below 0.50 inch have been 0.40 at Los Angeles, 0.44 at Punta Rasa and 0.49 at Key West.

Areas of High Barometer.—Of these, seven have been deemed sufficiently marked to merit description.

No. 1.—This area appeared on the Northern Pacific coast the afternoon of the 1st, and moving south-east by the morning of the 2nd was in Wyoming. Minimum temperatures of 32° were reported from Virginia City and Fort Custer, and 39° from Cheyenne. Moving northeast on the morning of the 3rd it had reached Minnesota, St. Paul barometer 0.23 above the normal. Its progress thus far had been marked by generally cool, clear weather, with no rain-fall. At that time freezing minimum temperatures were reported from northern Dakota and Minnesota. Moving slowly eastward its centre on the morning of the 4th was in Ontario; Toronto barometer 0.25 above the normal. Brisk southerly winds then prevailed on the Middle Atlantic coast, and at noon Cautionary Signals were displayed at Cape Hatteras and Kittyhawk. They

were lowered at midnight; justified by a maximum velocity of NE. 26 miles at Kittyhawk. The mid-night report of the 4th showed that the area had moved eastward over the Atlantic Ocean.

No. II.—On the afternoon of the 5th the barometer commenced rising in the lower St. Lawrence valley, and at the morning report of the 6th, Chatham barometer was 0.51 above the normal. Generally clear weather, with fresh northerly winds, then prevailed in the Canadian Maritime Provinces and Maine. Minimum temperatures of 25° at Father Point and 30° at Chatham were reported. Signals were displayed during the day on the Middle Atlantic and North Carolina coasts. Those on the New Jersey coast were lowered at midnight, justified by velocities ranging from E. 25 at Cape May to E. 32 miles at Sandy Hook. The signals on the North Carolina coast were not justified. The area moved southward during the 6th and 7th, and on the morning of the 8th the highest pressure was at Cape Hatteras—barometer 0.29 above the normal. The central pressure appeared to move northward during the night of the 8th and in the morning the highest pressure was over the Canadian Maritime Provinces, where it remained until its final disappearance on the 12th, the highest pressure during that time being at Chatham, where the barometer ranged from 0.29 on the 8th to 0.62 on the 12th above the normal. From the 8th to the morning of the 10th light local rains fell in New England and the Middle Atlantic States. On the afternoon of the 10th brisk north-east winds were reported on the New England coast, and Cautionary Signals were displayed from Wood's Holl to Eastport. These Signals were lowered the morning of the 11th, justified only at Eastport NE 26 miles. Severe gales, however, prevailed during that time in Newfoundland, doing great damage to property, driving several vessels ashore, and completely wrecking one barque.

No. III.—This area appeared in the Northwest the morning of the 12th, Duluth barometer 0.30 above the normal. At the afternoon report the highest pressure, still increasing, was over Lake Superior, and brisk southerly winds prevailed on lakes Superior and Michigan. Signals were then ordered for those lakes. Moving slowly eastward with generally clear weather and cool northerly winds, the centre the morning of the 13th was in Ontario, Parry Sound barometer 0.40 above the normal. Brisk northerly winds then prevailing on the Maine coast, an Off-shore signal was ordered for Eastport, which was lowered at midnight justified by a NW. wind of 26 miles. The Lake signals were then lowered, not justified except at Duluth, the maximum velocity being N. 21 at Milwaukee. From the 13th to the morning of the 16th the highest pressure remained over Ontario, Parry Sound barometer ranging from 0.18 to 0.38 above the normal. The area on the 16th moved eastward and remained with the highest pressure on the New Brunswick coast until its final disappearance on the 18th over the Atlantic ocean.

No. IV.—This area appeared on the California coast the morning of the 16th, San Francisco barometer 0.19, abnormally high. It moved eastward during the day and reached the Middle plateau district, where it remained until the afternoon of the 18th, when the highest pressure was at Denver, 0.49 above the normal. Moving northeastward during the day, on the morning of the 19th it was central over the Upper Lake region, Escanaba barometer 0.45 above the normal. At that time brisk to high northerly winds prevailed in the Lake region, with maximum velocities of 30 miles N at Cleveland, and 38 N at Sandusky. Minimum temperatures below or near the freezing point were reported from the entire Upper Lake region and the Northwest. Moving slowly eastward the highest pressure at the morning report of the 20th was over the Lower Lake region, over which section the barometer was quite uniformly 0.29 above the normal. At that time the Signals on the Atlantic coast from Smithville northward to Sandy Hook, and at Eastport were lowered having been justified as shown in connection with low areas Nos. IV and V. Changing its course to the southeast, on the morning of the 21st the area was central with diminished pressure on the New Jersey coast. It thence followed a northeasterly course and on the 22nd passed over the Gulf of St. Lawrence.

No. V.—This area appeared on the Northern Pacific coast the morning of the 21st, and in the afternoon the Olympia barometer was 0.32 above the normal. Moving eastward the highest pressure was over western Dakota on the morning of the 22nd, and at that time temperatures below or near the freezing point were reported from the Northwest. During the day the pressure rapidly increased from Dakota southward. In the afternoon, in connection with low area No. VI, rainy and threatening weather, with brisk to high winds, prevailed in the Upper Lake region, with a maximum velocity of NW. 35 miles at Milwaukee. Signals were then displayed for Lakes Michigan, Huron and Erie, which were justified as shown in description of low area No. VI, and Cautionary Off-shore signals were also ordered on the Texas coast. On the morning of the 23rd the isobar of 30.50 extended from Dakota southward to include Kansas—Bismarck, North Platte and Dodge City barometers respectively 0.59, 0.59 and 0.56 above the normal. Brisk to high northerly winds then prevailed in the Upper Lake region and in Texas. The isobar of 30.50 during the day covered the country from Indian Territory southward to Mississippi, but during the night moved slowly eastward and on the morning of the 24th covered the Upper Mississippi valley, St. Paul and Duluth barometers 0.57 above the normal. At that time minimum temperatures of 32° and under were reported from Indian Territory and Missouri northward to Manitoba, and from the greater part of the Lake region. Brisk northerly winds then prevailed in the Gulf States with maxima velocities of 26 N. at Galveston, 32 N. at Indianola and 34 NNE. at Port Eads. Brisk northerly winds with clear weather prevailed during the day in the Middle Atlantic, South Atlantic and Gulf States, fully justifying the Off-shore signals which had been displayed the afternoon of the 23rd from New York southward to Smithville. These signals were all lowered at midnight (24th) justified by velocities ranging from NW. 28 at Barnegat to NW. 52 miles at Cape May. The Texas signals were lowered at the same time, having been

fully justified by velocities of N. 28 at Galveston and N. 32 at Indianola. Moving slowly eastward the highest abnormal pressure on the morning of the 25th covered the Lower Lake region—Parry Sound barometer 0.75 above the normal. Minimum temperatures, at or below 32°, were then reported from the whole Lake region, New England, and the Middle Atlantic States—Rochester temperature, 19°. The Signals on the Atlantic coast were lowered too soon, as during the day severe northeast gales continued on the Middle and South Atlantic coasts, with velocities ranging from 25 to 47 miles, the maximum velocities being NE. 47 at Kittyhawk, and NE. 44 at Tybee Island. During the day the barometer rose rapidly in the Eastern Gulf States, but at midnight a slight fall was reported, and the northeast winds, increasing in force, had reached a maximum velocity of NE. 35 at Key West and ENE. 39 at Port Eads. Severe gales were reported from the Gulf which are treated in connection with low area No. VII. The area moved slowly eastward, the highest pressure the morning of the 26th being at Baltimore—barometer 0.73 above the normal, brisk to high northeast winds with partly cloudy weather prevailed during the day on the South Atlantic coast, the maximum velocity being 36 miles NE. at Cape Lookout. By the morning of the 27th, the central area had passed off the Middle Atlantic coast in advance of low areas Nos. VII and VIII. The passage of this area was marked by the minimum temperatures for the country east of the Rocky Mountains, except for the Lower Missouri and Upper Mississippi valleys, the Northwest and the Upper Lake region.

No. VI.—This area appeared on the North Pacific coast accompanied by light rain, the morning of the 25th and by the morning of the 26th the barometers at Olympia and Virginia City were 0.51 above the normal. At that time the pressure over the whole country was above the normal, being 30.70 in the Middle Atlantic and part of the New England States, 30.50 in Washington Territory and part of Idaho, and a small area of 30.40 in central Nebraska. Slight changes took place in connection with the centre of this area during the 27th, but the pressure gradually decreased and it slowly disappeared during that day and the 28th.

No. VII.—This area appeared in the Northwest at midnight of the 29th; Breckenridge and Bismarck barometers 0.22 above the normal. At this time, in connection with low area No. IX, brisk northwest winds, with threatening weather, continued in the Upper Lake region, where signals had been displayed on that afternoon. The pressure increased in the Northwest during the 30th, 30.50 over the greater part of Dakota; it moved slowly eastward, and by midnight was central over Lake Superior; Duluth barometer 0.50 above the normal. On the morning of the 31st minimum temperatures of 10° and under were reported from the Northern Rocky Mountain slope, the Northwest and northern portions of Missouri and Mississippi valleys. The lowest temperatures were 1° at Pembina and—1° at Deadwood, being with 0° on Mount Washington, the lowest reported during the month. This area was marked by the minimum temperatures for the Missouri and Upper Mississippi valleys, the Northwest and the Upper Lake region.

Areas of Low Barometer.—On map No. I are charted the tracks of the centre of eight areas of low barometer. Nine areas have passed over the country during October, but the path of area No. III was too uncertain to permit its accurate location.

No. I.—This area was a continuation of No. IX of the September *Review*. Central in Dakota the morning of the 1st, it moved northeastward and reached Manitoba by midnight, its progress marked by light rains and brisk southerly winds in the Northwest and Upper Lake region. Cautionary Signals were displayed at Milwaukee and Duluth during the afternoon, and at midnight for Lake Michigan and at Alpena and Marquette. On the morning of the 2nd, it was central in Northeastern Minnesota at which time cloudy weather and rain, with brisk southerly winds prevailed in the Upper Mississippi valley and on Lakes Michigan and Superior. By afternoon the centre had reached the eastern end of Lake Superior, at which time brisk westerly winds with cloudy weather and rain prevailed, and maximum velocities ranging from 28 to 32 miles were reported, from the Upper Lake region, while partly cloudy weather with fresh to brisk westerly winds prevailed in the Lower Lake region. Cautionary Signals were then displayed at Port Huron, Detroit, Toledo and Sandusky. At midnight the area was central north of the Lower Lake region, while cloudy and rainy weather prevailed with brisk to high southwest winds on Lake Huron and the western part of Lake Erie, with a velocity of SW. 38 miles at Saugeen. Cautionary Signals were then displayed for Lake Erie from Cleveland to Buffalo. On the morning of the 3rd the centre had reached the Lower St. Lawrence valley. Threatening and rainy weather with brisk to high southwest winds were reported from New England, and the Lower St. Lawrence valley. Signals were then displayed on the New England coast from Wood's Holl northward to Eastport. In the Lake region, cloudy or partly cloudy weather, with fresh westerly winds were reported, and all signals therein were lowered; these signals were justified by velocities ranging from SW. 25 at Grand Haven to W. 32 at Duluth, and SW. 38 at Saugeen, except at Escanaba, Marquette, Buffalo, Erie and Port Huron, where velocities ranging from 13 to 20 miles occurred. Changing its course to the southeast with decreased pressure, the area was central on the afternoon of the 3rd in the Gulf of St. Lawrence; Chatham barometer 0.29 below the normal. Signals on the New England coast were continued until the 4th, on account of the rapidly recovering pressure, and were lowered in the afternoon. They were justified except at Eastport, and a maximum velocity of W. 28 miles was reported at Thatcher's Island.

No. II.—On the morning of the 2nd this area appeared on the Oregon coast. During the day light rain fell in the North Pacific region, and the centre moving eastward was on the morning of the 3rd in

Montana—Virginia City barometer 0.26 below the normal. During the day brisk to high southerly winds prevailed in the Northwest, and by midnight the centre, with decreased pressure, had reached eastern Manitoba. On the morning of the 4th it was north of the Lake Superior region from which section brisk southerly winds were reported. Signals were then ordered for Lakes Superior and Michigan, except at Chicago. The centre moving northward these signals were lowered on the morning of the 5th, not having been justified, a maximum velocity of SW 24 only being reported from Marquette.

Area No. III.—The track of the centre of this area was too indefinite to permit its accurate charting. On the afternoon of the 3rd a new depression, accompanied by fresh southerly winds, threatening weather and light rains, appeared on the North Pacific coast, where by the afternoon of the 4th, the barometer steadily falling, reached at Olympia 0.60 below the normal. The area moving eastward, on the afternoon of the 5th caused an extensive barometric depression ranging from 0.20 to 0.50 inch below the normal, which covered the country from Minnesota and Iowa westward to the Pacific ocean. Slight changes occurred over this region until the midnight of the 5th, when the barometer again fell sharply on the North Pacific coast. On the morning of the 6th the line of normal pressure ran from Lake Superior southeastward to the Georgia coast. The country from Minnesota and Iowa westward to the Pacific coast was then covered by a pressure from 0.20 to 0.50 below the normal, while in the Gulf States the New Orleans barometer read 0.24 below the normal. At noon of the 6th Cautionary Signals were displayed at New Orleans and Port Eads, and in the afternoon at Mobile and St. Marks. On the afternoon of the 6th a decided decrease of pressure was reported from Oregon, Dakota and the Gulf States. Cloudy and rainy weather prevailed in the north and Central Pacific coast regions and in the Gulf States, while from Nebraska and Minnesota southerly gales were reported. Cautionary Signals were displayed at Duluth and Alpena. At midnight the Mobile barometer was 0.37 below the normal, while rainy weather, with brisk, variable winds, were reported from the Eastern Gulf States, with a maximum velocity of SE. 25 miles at St. Marks, and the tide rose five feet above the mean. But slight changes had taken place from the Upper Lake region westward to the Pacific. The morning report of the 7th showed a sharp barometric rise on the Oregon coast and in the Eastern Gulf States, with the centres of the depression apparently located in the Central Mississippi valley, Memphis barometer 0.30 below the normal, and in the Middle Plateau district, Salt Lake barometer 0.47 below the normal. During the 7th the depression in the Mississippi valley disappeared while the pressure from the Mississippi valley westward to the Pacific coast gradually recovering, by midnight was in a nearly normal condition, except from Colorado northeastward to Manitoba, where a barometric trough of 0.30 below the normal yet existed. The signal at Alpena was then lowered, the wind having attained a velocity of only SE. 20 miles. The barometric trough moved slowly northeastward and passed into Manitoba the morning of the 10th, when the Duluth signal was lowered not having been justified.

No. IV.—This area apparently developed in the Caribbean Sea, and on the afternoon of the 11th was central southeast of the Island of Jamaica. By the morning of the 12th it reached the eastern end of that Island, and by midnight of the 13th was central near the Island of Cuba, southwest of Havana. From the morning of the 11th until the afternoon of the 14th, 19.80 inches of rain-fall were reported from Kingston Jamaica. In the rest of the island exceedingly severe rains did serious injury to property and crops. Reports state that 13 lives were lost in Kingston. Many bridges, houses and much stock were swept out to sea, and all communication obstructed. The reports from the Gulf stations showing a steady decrease of pressure, a Cautionary signal was displayed at Key West the morning of the 12th. The cyclone moved slowly northeastward, and by the afternoon of the 14th, was central in the southeastern part of the Gulf. Signals were then displayed at New Orleans, Port Eads, Mobile and St. Marks. At this time Key West barometer was 0.31 below the normal, with a southeast wind of 26 miles, while fresh northeast winds were reported from the northeastern Gulf. The area moved slowly northeastward and at midnight of the 15th was central in the northeastern Gulf. At that time brisk southeast to northeast winds prevailed in the Eastern Gulf, States the Mobile barometer was 0.38 below the normal, while St. Marks reported a heavy rain of 2.36 inches in eight hours with a maximum velocity of E. 28 miles. The morning report of the 16th showed the centre over southern Alabama, Mobile barometer 0.51 below the normal. Brisk easterly winds were reported from Florida, with a maximum velocity of E. 32 at St. Marks, and a heavy rain-fall of 2.10 inches in eight hours from Montgomery. At noon Cautionary Signals were ordered for Jacksonville, Savannah and Charleston. By the afternoon of the 16th the centre had reached the central Mississippi valley, Memphis barometer 0.38 below the normal. The signals on the Gulf coast and from Jacksonville to Savannah were then lowered, having been fully justified. At midnight of the 16th reports showed it central with diminished energy in Illinois. Its subsequent track is described as that of area No. V., with which it united in Wisconsin on the morning of the 17th.

No. V.—This area appeared on the Oregon coast on the morning of the 11th, and during that afternoon was central in Oregon; Portland and Roseburg barometers 0.72 below the normal. At that time rainy weather, with light southerly winds prevailed in the Northern Pacific coast region. Moving slowly eastward it was central at midnight in the valley of the Columbia river; thence turning southward during the 12th, 13th and 14th, it moved slowly into the Southern Plateau district, its progress being marked by cloudy weather and light precipitation, light snow falling in Nevada. During the night of the 14th changing its course to the northeast, it was central the morning of the 15th in Colorado—Denver barometer 0.31 below the normal. By the morning of the 16th its centre was in western Dakota—Bismarck barometer 0.43 below the normal. At that time cloudy or rainy weather prevailed in the Upper Mississippi valley

and the Northwest. The afternoon reports showed its centre in Dakota. At that time northerly gales, with rain, prevailed in the extreme Northwest, and cloudy weather, with variable winds in the Upper Lake region. Cautionary Signals were then displayed for Lake Superior and at Escanaba. On the morning of the 17th, this area united with low area No. IV and reports at that time showed it to be central, with decreased pressure, in Wisconsin. Rainy or threatening weather, with fresh to brisk southerly winds then prevailed in the Lake region, with a maximum velocity of S. 26 reported from Sandusky. Cautionary Signals were then ordered for the rest of Lake Michigan and for Lake Huron. The afternoon reports of the 17th showed that the central area had passed northward beyond the Lake region. Brisk southwest to northwest winds yet prevailed in that section, with a maximum velocity of SW. 36 miles at Milwaukee. The course of this area during the 18th was too far north of the Lake region to permit accurate charting. During that time southwest to northwest winds, cloudy weather and rain prevailed in the Lake region. The signals displayed in that section were lowered on the afternoon of the 18th having been justified by velocities ranging from NW. 27 at Alpena to NW. 38 at Duluth. On the morning of the 18th signals were ordered on the Atlantic coast from Lewes northward to Sandy Hook. At midnight rainy and threatening weather, with brisk southerly winds, prevailed in the Middle Atlantic and New England States, with a maximum velocity of S. 28, at Cape May. Changing its course during the night to the southeast, on the morning of the 19th the area was central in Maine, Eastport barometer 0.30, abnormally low. Rainy and threatening weather then prevailed in New England and the Middle Atlantic States, with a maximum velocity of NW. 42 miles, at Sandy Hook. Cautionary Signals were then ordered from New York eastward along the coast to include Eastport, and in connection with high area No. IV from Norfolk southward to Smithville. By midnight the centre had passed through Nova Scotia and was over the Atlantic Ocean. During the day brisk northwest winds, with generally clear weather prevailed along the Atlantic coast from Eastport to North Carolina, and a maximum velocity was reported of N. 40 miles at Cape May. At that time the Cautionary Signals from Portland southward to include New York, were lowered having been justified by velocities ranging from NW. 25 at New Haven to NW. 38 at Thatcher's Island. On the morning of the 20th signals from Sandy Hook southward to include Smithville, were lowered, having been justified by velocities ranging from N. 32 at Macon to NE. 40 at Kittyhawk, and N. 40 at Cape May.

No. VI.—This area appeared in the Northwest on the 21st, moving southeastwardly from Manitoba, and at the afternoon report was central in Dakota, Pembina barometer 0.31 below the normal. Reaching southern Minnesota at midnight—its course thus far marked by no precipitation—it changed its direction to the northeast, and on the morning of the 22nd was central in northern Michigan. Moving eastward during the afternoon of the 22d, it was central over Lake Huron. At that time partly cloudy weather with brisk southerly winds prevailed over the Lower Lake region, while in the Upper Lake region rainy and threatening weather with brisk northwest winds were reported—maximum velocity NW 35 at Milwaukee. Cautionary Signals were then displayed for Lakes Michigan, Huron and Erie. At midnight the centre had reached Ontario—Parry Sound barometer 0.21 below the normal. At that time rainy or threatening weather, with brisk westerly winds prevailed in the Lake region and Middle Atlantic States, maximum velocities in the first section ranging from W 25 at Port Huron to W 30 at Alpena. Signals were then displayed for Lake Ontario, and were lowered at Escanaba, Chicago and Milwaukee, justified except at Escanaba by NW 36 miles at Milwaukee. Morning report of the 23rd showed the centre to be in the Upper St. Lawrence valley, Burlington, barometer 0.23 below the normal. Cloudy and threatening weather was then reported from New England and the Lower Lake region with brisk westerly winds, the maximum velocities in the latter district ranging from W. 25 at Toledo and Buffalo to W. 40 at Sandusky. A cautionary signal was then displayed at Eastport. The centre that afternoon was in Maine. The signals at Detroit and all on Lake Michigan, except Grand Haven, were then lowered having been justified, except at Escanaba, by velocities ranging from NW. 25 at Toledo to NW. 36 at Milwaukee. On the morning of the 24th the area having moved eastward was central over the Atlantic ocean. The signals on Lake Huron and at Grand Haven and Toledo were then lowered, and in the afternoon those yet remaining in the Lake region, having been justified, except at Oswego, by maximum velocities ranging from NW. 25 at Toledo to W. 45 at Sandusky. This area being rapidly followed by high area No. V, caused the storm to be unusually severe in the Lake region. A schooner and a steam barge were disabled on Lake Erie, and on Lake Huron one schooner was disabled, one driven ashore, and from a barge one man was lost. The signal at Eastport was lowered at midnight of the 24th not justified, the wind, however, attaining a velocity of S. 22 miles.

No. VII.—The morning and afternoon reports of the 25th showed rapidly increasing pressure in the Eastern Gulf States and Florida, while a slight decrease was reported from the Western Gulf States, with a NE. wind of 26 miles at Key West during the afternoon. At midnight a barometric fall was reported from the Eastern Gulf States, and high northeast winds then prevailed from Key West westward to Port Eads, attaining maximum velocities of 39 ENE. at Port Eads, and 34 NE. at Key West. During the 26th decreasing pressure and easterly winds prevailed in the Eastern Gulf, with maximum velocities of 26 NE. at Key West and 43 NE. at Port Eads. A schooner which left Key West on the 25th for Punta Rasa was compelled to return the morning of the 26th, on account of severe weather. Marine reports show violent easterly gales in the Eastern Gulf during all that day and the 27th. The Brigantine *Woodland* leaving Port Eads on the 25th was compelled to return in distress the 28th; schooner *Sallie* which left Pensacola on the

26th was completely wrecked and lost all her crew but two men. Three other vessels were disabled and in distress. The S. S. *Capri* reported a "hurricane" 200 miles ESE. of Port Eads on the 26th and 27th. On the afternoon of the 27th the area was central west of the middle Florida coast, Punta Rassa barometer 0.12 below the normal. No signals were displayed in the Gulf during the passage of this area. Moving very rapidly northeastward by midnight, the centre was probably off the Georgia coast. During the day very heavy rain fell in Georgia, Florida and South Carolina, with the following totals reported: Key West 1.36 inches, St. Marks 4.28, Jacksonville 2.21, Savannah 1.02 and Charleston, S. C., 1.94. On the morning of the 28th the area was probably central off the North Carolina coast; Cape Lookout reported the barometer 0.28 below the normal and Cape Hatteras 3.00 inches rainfall in eight hours. On the North Carolina coast fresh northerly winds were reported, their force being probably weakened by the influence of advancing low area No. VIII. Severe easterly gales were reported, however, on the eastern side of the area, northwest of Bermuda. During the day the area moved northward with great rapidity, and with diminishing pressure. Central in Rhode Island the afternoon of the 28th, by midnight it had united with low area No. VIII in Maine. During its passage northward on that day the winds on the Jersey coast veered to the westward, and the unusual maximum velocities of W. 48 at Sandy Hook and NW. 64 at Cape May were reported. Signals had been displayed on the Atlantic coast on the 27th for low area No. VIII, in connection with which they are considered. The subsequent path of this area is described as that of No. VIII.

No. VIII.—This area appeared in Manitoba during the night of the 26th, and moving southeastward was central on the morning of the 27th in Minnesota. Brisk westerly winds with partly cloudy weather and no precipitation then prevailed on Lakes Superior and Michigan. The afternoon reports showed the centre to be over the northwestern portion of Michigan, with greatly decreased pressure—Escanaba barometer 0.34 below the normal. Brisk southerly winds with cloudy weather prevailed in the Upper Lake region, with maximum velocities of 26 miles at Milwaukee and Grand Haven, while from the Northwest northwest gales were reported, with rain in the Upper Mississippi valley. Moving southeastward by midnight, the centre had reached, with still decreasing pressure, northern Michigan. At that time brisk southerly winds with threatening weather prevailed in the Lower Lake region, while in the Upper Lake region the winds had veered to northwest, and were brisk or high with maximum velocities reported of W 36 at Milwaukee, and NW 37 at Grand Haven. Cautionary Signals were then ordered at Grand Haven and for Lakes Huron, Erie and Ontario, except for Oswego. On the Atlantic coast, in connection with this area and high area No. VII, Cautionary Signals were displayed from Smithville northward, to include Cape Henry. At the morning report of the 28th the storm was central with decreased pressure in Ontario—Saugeen and Toronto barometers respectively 0.54 and 0.55 below the normal. Brisk southwest and south winds, with rainy or threatening weather prevailed in the Lower Lake region, while brisk to high northwest winds continued in the Upper Lake region. Maximum velocities of 36 miles were reported from Toledo, Sandusky and Grand Haven. Cautionary signals were then ordered for Oswego and on the Atlantic coast from Lewes northward to New York. The afternoon reports showed the area central in northern New York, Kingston barometer 0.55 below the normal. At this time in connection with low area No. VII a deep barometric trough ranging from 0.28 to 0.67 below the normal covered New England, the Middle Atlantic States, the Lower Lake region and Lake Huron. Cloudy weather and rain prevailed in New England and the Lower Lake region, with fresh to brisk variable winds in New England, and westerly winds, ranging from fresh to a gale, were reported from the Middle Atlantic States and Lower Lake region. Maximum velocities, ranging from 26 to 64 miles on the Jersey coast, were reported in connection with low area No. VII, and in the Lower Lake region ranging from 25 to 46 miles, in connection with area No. VIII. At this time area No. VIII was central in Rhode Island. Cautionary signals were then displayed at Portland and Eastport, and the Cautionary signals on the Atlantic coast from Smithville northward to New York were changed to Off-shore. Off-shore signals were also ordered from New Haven northward to include Thatcher's Island. At midnight areas No. VII and VIII united, with their centre in southeastern Maine. Portland barometer 0.90, below the normal. At this time variable winds prevailed in New England, with heavy rain and a northeast gale—48 miles—at Eastport. Brisk to high westerly winds, with generally clear weather, prevailed in the Middle Atlantic States and Lower Lake region, with maximum velocities on the Atlantic coast of W. 46 at Cape May and on the Lakes of SW. 35 at Sandusky. Moving northeastward the centre, on the morning of the 29th, was in New Brunswick, Eastport barometer being remarkably low, 28.82, or 1.16 below the normal; three hours earlier it had touched 28.775. At this time the reports for the preceding eight hours showed fall of the barometer in New Brunswick and Nova Scotia, ranging from 0.37 at Eastport to 0.56 inch at Chatham below the normal. Easterly gales then prevailed on the Atlantic coast as far south as Delaware, while brisk winds still continued in the Lake region in connection with advancing area No. IX. Signals were then lowered on the Atlantic coast from Cape Henry southward to Wilmington. In the afternoon the centre was in the Gulf of St. Lawrence, Halifax barometer, 28.82, or 1.06 below the normal. A barometric rise along the New England coast in eight hours, ranging from 0.15 at New London to 0.35 at Portland above the normal, caused a continuance of the brisk westerly winds. Maximum velocities ranging from SW. 25 at New London to W. 39 at Boston were reported, while in the Lower St. Lawrence valley a northwest gale prevailed at Father Point. The signals on the Atlantic coast—fully justified—from Lewes northward to New York were then

lowered. At midnight the centre was near Cape Breton, Sydney barometer 28.73, or 1.16 below the normal. Fresh to brisk westerly winds and clear weather then prevailed in New England and the Middle Atlantic States. During the 28th the passage of this area was attended by a series of remarkably severe gales in Nova Scotia, and from that section eastward over the Atlantic and along the Banks of Newfoundland. An immense amount of damage was done to property in Nova Scotia, and the storm was considered the worst for years. At Port Hastings, Cape Jack, Caribou Cove, Port Richmond, Antigonish, and Guysboro, N. S., many houses were destroyed. Probably a hundred vessels suffered more or less injury during the 28th and 29th, and with scarcely an exception they report the gales encountered as most violent. On the morning of the 30th the central area had passed eastward beyond the Canadian maritime stations.

No. IX.—This area appeared in Manitoba on the 28th, and moving southeastward at midnight was central in Minnesota, Pembina barometer, 0.57 below the normal. The barometric pressure of the whole country was below the normal except in the Plateau District and the Northern Pacific Coast region, the Lake region being covered by an abnormal pressure ranging from 0.19 to 0.60 below the normal. It caused this area to move eastward with great rapidity. On the morning of the 29th it was central with diminished pressure north of Lake Michigan, Marquette barometer 0.65 below the normal. Brisk to high westerly winds prevailed in the Upper Lake region, and brisk southerly in the Lower Lake region, with a velocity of 9 miles NW., reported from Milwaukee. Cautionary Signals were then ordered for all stations on the Upper Lakes. The afternoon report showed the central area to be east of Lake Huron. Westerly winds ranging from high to a gale were then reported in the Upper Lake region and Lake Erie, with maximum velocities ranging from 28 at Duluth, Marquette and Sandusky to 40 at Milwaukee and Saugeen. Cautionary Signals were then ordered for Detroit and for all stations on the Lower Lakes. During the day one steamer was wrecked and three schooners driven ashore on Lake Michigan. The storm was reported as being particularly violent over Lakes Michigan and Erie, being the heaviest northeast gale of the season at Cleveland. By midnight of the 29th the centre had reached northern New York, Burlington barometer 0.62 below the normal; the isobar of 30.50 at that time extended through New England, the St. Lawrence valley, and part of Ontario and New York, while the pressure of 0.74 below the normal yet prevailed over Nova Scotia in connection with area No. VIII. The morning report of the 30th showed that the area had moved rapidly northeastward and that it was central in the Lower St. Lawrence valley, Father Point barometer 0.65 below the normal. Brisk to high westerly winds then prevailed in the Lower Lake region, where maximum velocities changing from 26 to 37 miles were reported. Off-shore signals were then displayed on the New Jersey coast, and the Cautionary signals at Eastport and Portland were then changed to Off-shore, while the Off-shore signals from New Haven to Boston displayed in connection with low area No. VIII remained. All signals on the Upper Lakes were then lowered, having been justified by winds ranging from NW. 38 at Marquette, Escanaba and Duluth to W. 40 at Milwaukee. During the afternoon of the 30th the storm was central over the Gulf of St. Lawrence, and Cautionary signals in the Lower Lake region were then lowered, justified by velocities ranging from W. 30 at Rochester to W. 37 at Cleveland. At midnight all Off-shore signals from Eastport southward to Cape May were then lowered, having been fully justified. These signals were lowered somewhat soon as brisk to high northerly winds continued on the Atlantic coast until midnight of the 31st, with maximum velocities ranging from 28 at Cape Lookout and Portland to 33 at Boston and 42 at Cape May.

INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low-pressure areas over the North Atlantic Ocean and neighboring waters and continents during the month of September, 1879, and is based upon data received at this office up to October 31st, 1879. Nos. V and VI are charts for the month of March, 1878, and are based upon International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

On Chart No. IV the tracks of eight areas of low pressure are traced, which, during a portion of their existence, were located over the North Atlantic Ocean. Areas I, III, IV and VI are prolonged tracks, portions of which have already appeared on Charts I and IV of the *September Review*. No. I was probably central on the morning of September 1st about 60° N., 40° W. On this day southerly winds prevailed over the Atlantic, between 45° and 55° N., veering to SW. and W. westward of 30° W.; strong SW. gales, squally and rainy weather and confused or high westerly seas were reported between 30° to 45° W., and 46° to 53° N. On the 2nd a sudden fall of the barometer occurred over the northern portions of the British Isles and the depression moved eastwardly to the coast of Norway. A "heavy" gale prevailed along the north coast of Ireland and a "violent" gale was experienced in the northeast of Scotland, doing about \$2,000 damage to boats engaged in the herring fisheries; "captains of river steamers arriving at Glasgow reported the weather down the frith of Clyde as fearful." The winds over the Atlantic between 45° and 54° N. changed to SW. eastward of 30° W., and to northerly westward of that meridian. No. II appeared about mid-ocean in 45° N. on the 4th, on which day easterly winds generally prevailed from 10° to 33° W. in about 50° N. with thick weather and rain near centre of depression; on the 5th it had moved northward, followed by rapidly rising and high barometer from the 30th meridian westward, as the "anti-cyclone" or area of high barometer, which had covered the British Isles since the passage of preceding low area, moved slowly away in an easterly direction; on the 6th the barometer fell over the British Isles, with southerly winds and rising tempera-

ture generally, and heavy rains at some of the western ports; on the 7th and 8th it passed in an irregular course centrally over Ireland and Scotland accompanied by southerly to westerly gales and heavy rains, followed over the eastern half of the Atlantic between 45° and 55° N. by northerly squalls and gales, which on the 9th spread eastward over the British Isles. No. III moved eastward north of Newfoundland on the 9th; on the morning of the 10th the weather was still unsettled at St. Johns but cleared during the day with slowly rising pressure. On the 11th the pressure increased rapidly off the coast of Newfoundland with easterly winds at St. Johns, and the area of low barometer was probably transferred to the eastern half of the ocean north of 50° N. On the 11th the barometer fell rapidly, and on the morning of the 12th a very extensive depression covered the British Isles, but with its centre at some distance to the northwest of Scotland; dull, rainy and squally weather prevailed over the British Isles, and on the coast of Norway the wind rose to a southerly gale. No. IV passed northeastward over Labrador on the 18th. No. V appeared as a large depression off the northwest coast of Ireland and Scotland on the 20th, moving toward the northeast; westerly gales were experienced westward to 15° W. No. VII probably formed in the southwest quadrant of area No. V on the 21st; on the 22nd it developed into quite a severe storm, and was encountered off the north of Ireland by steamer Corinthian which reported a severe gale from NE and high seas; and ship Spartan, when three miles northwest of Inishtrahull Light, which vessel reported "cyclone from SW. to SSE., and later from WNW.," lost entire suit of sails. S. S. Cybele, at Quebec, October 3rd from Glasgow, reported loss of captain "who was supposed to have been washed overboard during a violent gale on the morning of the 23rd." On this day (23rd) severe northwest gales and very high confused seas prevailed from 15° to 25° W. and from 46° N. northwards. At 7 a. m. the barometer at Stornoway read 28.37, wind SSW, light. Very heavy gales were experienced during the night of 23rd-24th along the east coast of Northumberland. No. VI moved eastward over Newfoundland on the 25th, followed by cold NW. winds, clear weather and rapidly increasing pressure on the 26th, on which day rainy and squally weather prevailed over the ocean in lat. 50° N., from 45° to 20° W. On the 27th and 28th it passed northeastward north of the British Isles, producing strong southeast to southwest gales on the British and Norwegian coasts; in England heavy rains caused much damage to crops. From the 25th to the end of the month an area of high barometer existed over Newfoundland which probably extended over the western portion of the ocean, but on the 30th an area of quite low pressure appeared over the eastern half, central in the morning probably near 20° W. 55° N., and which after having being preceded by a southerly gale on the east coast of Scotland during the night of the 30th, passed slowly eastward from Oct. 1st to 3rd, with its centre to the north of Scotland, producing westerly winds and heavy rains over the British Isles. *Pacific Ocean.*—During the months of May and June, 1879., areas of quite low pressure were observed along the China coast on the following dates:—May 17th, 23rd and 24th, 29th, June 4th and 5th, 11th to 13th, 17th to 19th and on the 30th. The probable positions of the centre of the area observed from the 17th to the 19th of June are indicated on Chart IV, but in regard to the other areas the data as yet to hand is insufficient to enable us to locate the centers. *Indian Ocean.*—On August 19th, 1879, Ship Dunalister, in 39° $30'$ S, 50° E, experienced a hurricane which lasted two days, and threw vessel on her beamends, wind WSW veering to SW, and ending S, lowest reading of barometer 29.50. *South Pacific Ocean.*—Ship Edderside at San Francisco, Oct. 1st, 1879 from Sydney, NSW. reports: off the coast of Australia encountered a violent hurricane, commencing at WSW. and ending at ENE., accompanied with very heavy sea, decks constantly filled with water, gale lasted eight hours. At Brisbane, NSW. a terrific hurricane uprooting large trees &c., occurred on the night of June 23rd, 1879.

TEMPERATURE OF THE AIR.

The isothermal lines upon Chart No. II show the general distribution of the temperature for the month of October, 1879, accompanying which is a table of comparative temperatures. In strong contrast with the month of September, the mean temperature of the present month over the eastern section of the country is decidedly above the average of the past eight years, ranging from 3 to 4 degrees in the Gulf States, 5 to 6.5 degrees in the Atlantic States and from 8 to 9.5 degrees in the Ohio valley, Lake region and Upper Mississippi valley. Westward of the latter the excess rapidly diminishes, being 7 degrees in the Missouri valley, and 3.3 over the middle Eastern Rocky Mountain slope. West of the Rocky Mountains it is below the normal, the deficiency ranging from 1 to 4 degrees. On the summit of Pike's Peak, Col., at an elevation of 14,150 feet, the mean temperature was 26.3, or 4.9 above the mean of the five preceding Octobers, and on the summit of Mt. Washington, at an elevation of 6,285 feet, 29.8, or 5.6 degrees above the mean of the eight preceding Octobers. The following table shows the established mean temperature of the month of October for 40 places, included within the area of high temperature, as accurately as the same can be computed from material at present in the possession of this office, with the number of years covered by the observations from which they are deduced. On comparing these means with those for the present month it is found that only four show an excess of less than 4 degrees, namely, Key West, Mobile, Norfolk and West Point. Those having an excess of 10 degrees or more occur in Ohio, Illinois, Michigan, Iowa and Minnesota. In the sixth column is given the highest maximum October temperature at each place yet published and of which this office possesses a record. On comparing these with the maxima of the present month it is seen that higher temperatures have been recorded at most stations in New England and New York during the present October than ever before, while in the other districts the previous maxima have not been exceeded, excepting at Ft. Brady and Dubuque.

PLACE OF OBSERVATION.	No. of years of observation.	Established mean.	Mean for 1879.	Difference.	Highest maximum temperature published.	Maximum in 1879.	Difference.
Fort Preble, Me.....	35	49.01	54.08	+ 5.07	74°	82°	+ 8°
Gardiner, Me.....	40	46.6	52.5	+ 5.9	77	80	+ 3
Portland, Me.....	46	46.3	55.6	+ 9.3	77	83	+ 6
Burlington, Vt.....	39	47.2	54.7	+ 7.5	—	78	—
Lunenburg, Vt.....	28	44.5	50.3	+ 6.2	83	84	+ 1
Boston and Cambridge, Mass.....	96½	50.8	56.6	+ 5.8	—	88	—
Fort Independence, Mass.....	36	52.8	57.6	+ 4.8	83	80	- 3
Lawrence, Mass.....	23	48.0	55.0	+ 7.0	75	80	+ 5
Mendon, Mass.....	46	48.5	56.7	+ 8.2	84	78	- 6
New Bedford, Mass.....	67	52.8	56.8	+ 4.0	83	82	- 1
Newport, R. I.....	49	53.3	58.4	+ 5.1	79	81	+ 2
New Haven, Conn.....	86	51.1	59.0	+ 7.9	83	83	0
Plattsburg Barracks, N. Y.....	24	46.0	55.6	+ 7.5	78	74	- 4
Albany, N. Y.....	51	49.0	56.1	+ 7.1	80	81	+ 1
West Point, N. Y.....	54	54.3	58.1	+ 3.8	87	89	+ 2
Fort Columbus, N. Y.....	58	54.6	61.5	+ 6.9	86	84	- 2
Rochester, N. Y.....	48	48.8	57.9	+ 9.1	83	86	+ 3
Buffalo, N. Y.....	36	49.1	58.3	+ 9.2	80	83	+ 3
Philadelphia, Pa.....	68	54.8	61.7	+ 6.9	88	87	- 1
Pittsburgh, Pa.....	20	63.1	60.7	+ 7.6	—	91	—
Baltimore, Md.....	44	56.6	63.1	+ 6.5	89	89	0
Washington, D. C.....	50	55.6	62.5	+ 6.9	90	92	+ 2
Fort Monroe, Va.....	54	61.9	67.4	+ 5.5	89	85	- 4
Norfolk, Va.....	33	61.7	64.9	+ 3.2	—	87	—
Charleston, S. C.....	33	65.4	70.3	+ 5.2	89	87	- 2
Savannah, Ga.....	34	66.2	70.5	+ 4.3	88	86	- 2
Key West.....	44	78.7	79.8	+ 1.1	93	87	- 6
Mobile, Ala.....	18	65.9	69.7	+ 3.8	94	90	- 4
New Orleans, La.....	41	69.1	77.6	+ 8.5	90	86	- 4
Cincinnati, Ohio.....	55	53.8	64.8	+ 11.0	90	86	- 4
Chicago, Ills.....	25	46.3	60.5	+ 11.2	90	84	- 6
Detroit, Mich.....	38	49.6	58.9	+ 9.3	86	85	- 1
Fort Brady, Mich.....	32	43.9	54.1	+ 10.2	82	84	+ 2
Milwaukee, Wis.....	35	47.8	55.6	+ 7.7	81	81	0
St. Louis, Mo.....	49	55.4	62.5	+ 7.1	91.5	90	- 1.5
Iowa City, Iowa.....	40	48.0	59.1	+ 11.1	86	86	0
Dubuque, Iowa.....	25	48.9	59.0	+ 10.1	85	86	+ 1
Fort Snelling, Minn.....	42	47.3	57.5	+ 10.2	90	90	0
Fort Gibson, Ind. Ter.....	35	60.1	65.0	+ 4.9	95	89	- 6
Leavenworth, Kas.....	48	54.9	62.1	+ 7.2	93	89	- 4

An examination of the minimum temperature shows that that temperatures, ranging from -1° to 20° , occurred during the month in the Northwest and in parts of Nebraska. The line of 40° ran westward through the northern portions of South Carolina and the Gulf States to northeastern Texas, when it bent southwestward to the Rio Grande valley. The only stations in the country above 50° are those on the Gulf coast and in Florida. The maximum temperatures throughout the country were most remarkably uniform, ranging, with few exceptions, from 80° to 90° . The extreme temperatures, except at high stations, were 72° at Roseburg, 75° at Umatilla, 77° at Wood's Holl, 95° at Fort Buford, Dak., 96° at Visalia, Los Angeles and Knoxville, and 102° at Yuma, A. T.

Minimum Temperatures.—Maine: 22° at *Gardiner and 26° at Eastport. New Hampshire: 10° at *Dunbarton. Vermont: 22° at *Lunenburg and 26° at Burlington. Massachusetts: 16° at *Westborough and 25° at Boston. Rhode Island: 29° at *Fort Adams and 31° at Newport. Connecticut: 18° at *Mystic and 24° at New Haven. New York: 17° at *Nile and 19° at Rochester. Pennsylvania: 10° at *Wellsboro and 29° at Pittsburgh. Delaware: 36° at *Dover. Maryland: 22° at *Woodstock and 30° at Baltimore. District of Columbia: 28° at Washington. Virginia: 21° at *Snowville and 28° at Lynchburg and Fort Whipple. West Virginia: 22° at *Helvetia and 28° at Morgantown. North Carolina: 22° at *Highlands and 30° at Charlotte. South Carolina: 36° at *Aiken and 44° at Charleston. Georgia: 32° at *Gainesville and 40° at Augusta. Florida: 45° at *Fort Barrancas and 52° at Jacksonville. Alabama: 43° at Montgomery. Mississippi: 30° at Vicksburg. Louisiana: 39° at Shreveport. Texas: 31° at McKavett. Ohio: 17° at *Westerville and 35° at Columbus. Kentucky: 36° at Louisville. Tennessee: 27° at Nashville. Arkansas: 40° at Little Rock. Michigan: 18° at *Hudson and 22° at Marquette. Indiana: 19° at *Arlington and 30° at Indianapolis. Illinois: 16° at *Elmira and *Geneva and 28° at Chicago. Missouri: 21° at *Pierce City and 32° at St. Louis. Kansas: 16° at *Fort Wallace and 26° at Leavenworth. Wisconsin: 15° at *Neillville and 22° at La Crosse. Iowa: 11° at *Ames and 24° at Davenport and Dubuque. Nebraska: 12° at *Fort McPherson and 20° at North Platte. Indian Territory: 29° at Fort Gibson. Minnesota: 13° at Breckenridge. Dakota: 6° at *Olivet and 10° at Bismarck. Colorado: 18°

at *Fort Lyon and 20° at Denver. *New Mexico*: 26° at Santa Fe. *Wyoming*: 18° at Cheyenne. *Utah*: 33° at Salt Lake City. *Nevada*: 21° at *Carson City and 23° at Winnemucca. *Arizona*: 26° at Fort Apache. *Idaho*: 8° at *Fort Hall and 25° at Boise City. *California*: 24° at Campo. *Oregon*: 17° at Umatilla.

Maximum Temperatures.—*Maine*: 85° at *West Waterville and *Orono and 83° at Portland. *New Hampshire*: 84° at *Dunbarton, *Contoocookville and *Grafton. *Vermont*: 78° at Burlington and 84° at *Lunenburg. *Massachusetts*: 90° at *Somerset and 88° at Boston. *Rhode Island*: 83° at *Fort Adams and 81° at Newport. *Connecticut*: 92° at *Mystic and 83° at New Haven and New London. *New York*: 92° at *Nile and 88° at New York City. *Pennsylvania*: 91° at Pittsburgh. *Delaware*: 83° at *Dover. *Maryland*: 89° at *Emmitsburg and Baltimore. *District of Columbia*: 92° at Washington. *Virginia*: 91° at *Mount Solon and *Accotink, and 90° at Fort Whipple. *West Virginia*: 85° at Morgantown and 86° at *Helvetia. *North Carolina*: 92° at *Weldon and 87° at Charlotte. *South Carolina*: 87° at *Aiken and Charleston. *Georgia*: 32° at *Gainesville and 89° at Augusta. *Florida*: 89° at Punta Rassa and 98° at *Houston. *Alabama*: 90° at Mobile. *Mississippi*: 90° at Vicksburg. *Louisiana*: 89° at Shreveport. *Texas*: 100° at Pilot Point. *Ohio*: 94° at *Jacksonburg and *Norwalk, and 87° at Cleveland and Sandusky. *Kentucky*: 88° at Louisville. *Tennessee*: 96° at Knoxville. *Arkansas*: 89° at Little Rock. *Michigan*: 89° at *Lansing and 87° at Marquette. *Indiana*: 90° at *New Corydon and *Logansport, and 86° at Indianapolis. *Illinois*: 90° at *Peoria, *Hinsdale and *Decatur, and 87° at Cairo. *Missouri*: 90° at St. Louis and 97° at *Booneville. *Kansas*: 84° at Leavenworth and 91° at *Fort Wallace. *Wisconsin*: 87° at *Beloit, and 84° at Madison and La Crosse. *Iowa*: 87° at Keokuk and 90° at *Guttenburg. *Nebraska*: 93° at *Fort McPherson and 89° at North Platte. *Indian Territory*: 90° at Fort Sill. *Minnesota*: 89° at Breckenridge. *Dakota*: 95° at *Morristown and Fort Buford. *Colorado*: 91° at *Fort Lyon and 84° at Denver. *New Mexico*: 92° at La Mesilla. *Wyoming*: 80° at Cheyenne. *Utah*: 82° at Salt Lake City. *Nevada*: 84° at Winnemucca and 89° at *Fort Halleck. *Arizona*: 102° at Yuma. *Idaho*: 85° at Boise City and 86° at *Fort Hall. *California*: 96° at Los Angeles. *Oregon*: 75° at Umatilla.

Ranges of Temperature at Signal-Service Stations.—The monthly ranges will appear from an examination of the maxima and minima given. The greatest daily ranges vary in New England from 21° at Wood's Holl to 26° at Eastport and 35° at Boston. Middle Atlantic States, from 21° at Cape May to 30° at Albany and 33° at Washington. South Atlantic States, from 15° Portsmouth, N. C., to 33° at Augusta. Gulf States, from 13° at Key West to 16° at New Orleans and 35° at Shreveport. Ohio valley and Tennessee, from 25° at Indianapolis to 28° at Cairo and 36° at Knoxville. Lower Lakes, from 22° at Erie to 25° at Detroit and 33° at Rochester. Upper Lakes, from 22° at Chicago to 35° at Marquette. Upper Mississippi valley, from 26° at Davenport to 32° at St. Paul. Red River of the North valley, from 45° at Pembina to 48° at Breckenridge. Lower Missouri valley, from 32° at Leavenworth to 52° at Fort Stevenson. Eastern Rocky Mountain Slope, from 32° at Denison, 43° at Fort Gibson, 48° at North Platte to 54° at Uvalde. Rocky Mountains, from 31° on Pike's Peak, 36° at Santa Fe, 34° at Virginia City to 48° at Denver. Northern and Middle Plateau districts, 31° at Pioche, 35° at Boise City to 48° at Winnemucca. California, 20° at San Francisco, 37° at Red Bluff to 43° at Los Angeles.

Frosts.—Frosts have been too numerous and frequent to permit their being enumerated in detail. In the Plateau districts frosts occurred from the 8th. At Visalia, Cal., 9th to 11th. In the extreme Northwest, from the 10th. In the Northwest, 11th and after. New England and Lake region, from the 14th; Missouri and Upper Mississippi valleys, from the 19th. Middle Atlantic States and Ohio valley, from the 20th. Tennessee, from the 24th. Virginia, 24th to 26th. Georgia, 25th. Northern Alabama, 24th and 25th. Northern half of Mississippi and Louisiana, 25th. Texas, interior, 25th and after. Pensacola, Fla., 29th, "very light."

Ice has been generally reported north of Arkansas, Tennessee and North Carolina from the 23rd. It was reported in the interior of Texas from the 24th to 27th, and Indian Territory, 24th and 25th, and at Charlotte, N. C. on 25th and 26th.

Ground Frozen.—Catawissa, Pa., 25th; Hinsdale, Ill., 31st; Oregon, Mo., 24th; Dyberry, Pa., 26th, two inches; Embarras, Wis., 31st.

PRECIPITATION.

The general distribution of rain-fall for the month is illustrated as accurately as possible on Chart No. III, from about 500 reports; it is accompanied by a table giving the average precipitation for the month of October by districts. The rain-fall has been below the normal in all districts, excepting the South Atlantic and East Gulf States, the Lower Missouri valley, northern portions of Minnesota and Michigan and along the Pacific coast. In the Rocky Mountain region and Plateau Districts, the rain-fall has been moderate and probably about the normal amount for the month. Areas of quite small rain-fall are noticed in western Nevada, on the lee side of the Sierra Nevadas; and over portions of Colorado and Kansas, similarly situated with regard to most elevated portion of the Rocky Mountains—no rain is reported. An examination of the Chart shows extensive areas of less than one inch rain-fall covering California, and the whole western half of the Plateau Districts, the Eastern Rocky Mountain slope from Dakota to Texas, the Upper Mississippi valley from Dubuque to St. Louis, the Southwest from southern Missouri to the Gulf coast, and two large areas including portions of the Ohio valley, Lower Lake region, Middle States and New England. Severe draughts are reported in all these sections, and throughout the country generally, rivers and springs are reported very low. These will be noted in detail under their respective headings.

Those marked with * are voluntary reports.

Annual Rainfall.—The following report of rainfall measured by James G. Swan, voluntary observer at Neah Bay, Clallam county, Washington Territory, for the year ending September 30, 1879, is published as being probably the heaviest rainfall during a single year ever reported in the United States: October, 1878, 12.76 inches; November, 19.71; December, 8.48; January, 1879, 13.93; February, 24.33; March, 23.83; April, 7.68; May, 7.14; June, 1.48; July, 4.63; August, 5.84; September, 4.90. Total, 134.71 inches. The heaviest rainfall of published records in possession of this office are those of Neah Bay, W. T., 1867, 126.50 inches; 1865, 121.30 inches, and Baton Rouge, La., 1846, 116.40 inches.

Special Heavy Rains.—1st, Rio Grande, Tex., 1.24 in. in 35 min. 2nd, Vicksburg, 1.25 in. in 2 hours and 35 minutes; Melissa, Tex., 2nd and 3rd, 4.50 in. in 27 hours; New Ulm, Tex., 2.38 in. in 1 hour and 5 minutes. 3rd, Indianola, Tex., 4.71 in. in 5 hours and 15 minutes; Mobile, La., 1.03 in. in 2 hours. 4th, Thomasville, Ga., 2.40 in. in 4 hours and 30 minutes; Austin, Tex., 1.10 in. in 3 hours. 9th, Highlands, N. C., 1.92 in. 10th, Savannah, Ga., 1.18 in. in 1 hour and 40 minutes; Ft. Halleck, Nev., 1.06 in.; Ft. Davis, Tex., 2.88 in. in 16 hours; Lawrence, Kan., 1.5 in. 11th, Independence, Mo., 2.72 in.; near Arlington Ind., 1.00 in. in 1 hour. 12th, Okaloosa, La., 1.05 in. in 4 hours. 13th, Key West, 4.22 in. 15th, Ft. Meade, Dak., 1.24 in. 16th, Deadwood, D. T., 2.92 in. in 17 hours; Montgomery, Ala., 2.10 in. in 8 hours and 30 minutes; Ames, Iowa, 2.30 in.; Nora Springs, La., 1.50 in. in 1 hour; Cresco, La., 1.65 in. in 12 hours; Cairo, Ill., 2.53 in. in 11 hours 30 min. 17th, Montgomery, Ala., 3.13 in. in 7 hours and 30 minutes; Lenoir, N. C., 17th to 19th, 6.50 in.; Highland, N. C., 17th to 20th, inclusive, 11.59 in. of which 7.50 in. fell on the 17th; Asheville, N. C., 17th to 18th, 6.40 in. in 4 hours. 18th, Gainesville, Ga., 16th to 18th, 5 in.; Aiken, S. C., 2.25 in.; Forsyth, Ga., 16th to 18th, 2.85 in.; Murphy, N. C., 4.30 in. in 28 hours; Webster, N. C., 16th to 18th, 6.70 in.; Franklin, N. C., 16th to 18th 7.00 in.; Fort Barrancas, Fla., 4.53 in.; Atlanta, Ga., 1.48 in. in 16 hours. 20th Quitman, Ga., 1.50 in. 22nd, Thomasville, Ga., 4.40 in. in 16 hours, of which 1.56 in. fell in minutes. 26th, Brownsville, Tex., 2.20 in. in 6 hours 30 min. 27th, Key West on 26th and 27th, 3.37 in.; Fort Barrancas, Fla., 3.04 in. 28th, Cape Hatteras, 3.00 in. in 8 hours 30 minutes.

Largest Monthly Rain-falls.—Highlands, N. C., 15.83 in.; Key West, Fla., 14.20 in.; Thomasville, Ga., 13.78 in.; St. Marks, Fla., 12.94 in.; Fort Barrancas, Fla., 12.11 in.; Franklin, N. C., 11.40 in.; Montgomery, Ala., 10.20 in.; Daytona, Fla., 9.96 in.; Jacksonville, Fla., 9.45 in.; Quitman, Ga., 8.50 in.; Lenoir, N. C., 8.40 in.; Webster and Asheville, N. C., 8.10 in.; Kitty Hawk, N. C., 7.90 in.; Forsyth, Ga., 7.86 in.; Gainesville, Ga., 7.60 in.; Charleston, S. C., 6.74 in.; Cape Hatteras, N. C., 5.86 in.; Paducah, Ky., 5.59 in.; Atlanta, Ga., 5.44 in.; Murphy, N. C., 5.30 in.; Wytheville, Va., 5.25 in.; Mobile, Ala., 5.15 in.; Snowville, Va., 5.10 in.; Mt. Washington, N. H., and Melissa, Tex., 5.03 in.

Smallest Monthly Rain-falls.—Ft. Lyon, Cal., and Ft. Wallace, Kan., none; Cumberland, Md., Fayette, Miss., and Hector, N. Y., trace; Ft. McDermit, Nev., 0.05 in.; Ft. McHenry, Md., and Mendon, Mass., 0.09 in.; Wickenburg, Ariz., 0.10 in.; Pilot, Tex., 0.11 in.; Spiceland, Ind., 0.14 in.; Ft. Sill, I. T., 0.15 in.; Carson City, Nev., 0.18 in.; Augusta, Ill., and Denver, Col., 0.19 in.; Concho, Tex., 0.20 in.; North Platte, Neb., and Brackettsville, Tex., 0.21 in.; Fort Verde, Ariz., 0.23 in.; Norfolk, Va., 0.25 in.; Columbus, Ohio, 0.26 in.; Phoenix, Ariz., Laredo, Tex., and South Orange, N. J., 0.27 in.; Vevay, Ind., and Keokuk, Iowa, 0.28 in.; San Diego, Cal., 0.29 in.; Ruggles, Ohio, and Alcatraz Island, Cal., 0.30 in.; Linden, N. J. and Ithaca, N. Y., 0.31 in.; Patterson, N. J., 0.32 in.; Umatilla, Or., Yuma, A. T., and Yankton, D. T., 0.33 in.; Ashland, Wis., 0.35 in.; Prescott, Ariz., Pt. San Jose, Cal., and Lima, N. Y., 0.37 in.; Henrietta, Tex., and Ft. Columbus, N. Y., 0.38 in.; Margaretta, and Troy, Ohio, 0.40 in.; Philadelphia, Pa. 0.41 in.; Starkey, N. Y., 0.42 in.; Norwalk, Ohio, Wellsboro, and Hulmeville, Pa., 0.44 in.; Pen Yan, N. Y., 0.46 in.; Sandy Hook, N. J., 0.47 in.; Fallsington, Pa., 0.48 in.

Rainy Days.—The number of days on which rain or snow has fallen varies as follows: New England, from 5 to 13; Middle Atlantic States, 4 to 9; South Atlantic States, 4 to 20; Eastern Gulf States, 11 to 20; Western Gulf States, 5 to 10; Ohio valley and Tennessee, 6 to 10; Lower Lake region, 6 to 13; Upper Lake region, 9 to 15; Upper Mississippi valley, 4 to 10; Missouri valley, 7 to 9; Red River of the North valley, 6 to 11; Eastern Rocky Mountain slope, 1 to 5; Rocky Mountains, 1 to 4; California, 1 to 3.

Cloudy Days.—The number varies in New England from 4 to 17; Middle Atlantic States, 4 to 7; South Atlantic States, 5 to 18; Eastern Gulf States, 11 to 16, Western Gulf States, 2 to 5; Lower Lake region, 5 to 11; Upper Lake region, 7 to 14; Ohio valley and Tennessee, 3 to 9; Upper Mississippi valley, 3 to 6; Missouri valley, 2 to 5; Red River of the North valley, 3 to 11; Eastern Rocky Mountain Slope, 1 to 11; Rocky Mountains, 0 to 5; California, 3 to 5.*

Hail.—Hail has been generally reported during the month from Indiana and Michigan eastward to New England, in the Northwest, the Middle Plateau and on Pike's Peak. On the 10th hail fell at Augusta, Ga. The only wide-spread fall appears to have been on the 28th, when hail fell generally along Lake Erie and in the Middle Atlantic States. No storm of unusual severity has been reported.

Snow.—From the Lake region and Ohio valley eastward to New England, and as far south as Maryland, light snow was reported on the 24th. In the Plateau districts it appeared as early as the 8th, and on the eastern slope of the Rocky Mountains from the 15th.

Depth of Snow on Ground at end of Month.—Fort Collins, Col., 1.5 inches; Pike's Peak, 6 to 10 inches; Mt. Washington, 0.5 inch.

Droughts.—West Charlotte, Vt., 25th, drought very severe; Lake Champlain lower than ever remembered in fifty years, and falling every day. Waltham, Mass., drought during last half of month. Hector, N. Y., severe drought throughout the month. 17th, Brooklyn, N. Y., "no rain has fallen here for a month, and wells on Staten Island and in Jersey City are drying up;" New York City, "comparison with records for past twenty years, shows that the rain-fall from September 1st to October 17th, has not been as low as this year;" Philadelphia, "in towns well up the Schuylkill a water famine is prevailing. The Schuylkill is lower than for an indefinite period. Hundreds of canal boats are laid up for want of water to move them; "the drought in southern Livingston and northern Steuben Cos., N. Y., has already caused great damage to pastures, winter wheat and late corn." Nile, N. Y., 31st, great scarcity of water, many wells dry. Newburg, N. Y., 19th, authorities ordered the greatest economy in using water for fear of famine. 17th, Farmers throughout Camden and Burlington Co's, N. J., report fall crops suffering for want of rain and that water for domestic uses is difficult to obtain. Such an extended spell of dry weather has not been known for years in west and south Jersey." Linden, N. J., during 45 days rain-fall only 0.32; great scarcity of water. Wellsboro, Pa., drought unprecedented; the Tioga and Cowanesque rivers nearly dry; streams, springs and wells dry; water for domestic use hauled long distances. Schuylkill Co., Pa., severe drought continuing still on the 11th; many collieries stopped for a lack of water, crops already injured; at Mahanoy Plane "the wells in the town have been exhausted for some time, and the people are obliged to bring water half-a-mile." Harbour Creek, Pa., "people suffering from the effects of a prolonged drought; streams, springs and wells that never failed before are now nearly exhausted." Reading, Pa., "very severe drought; no rain has fallen for many weeks, streams, wells and springs are all drying up; water supply for city entirely inadequate to domestic uses." Pittsburg, Pa., "very severe drought is still prevailing in the surrounding country, wells dry, pastures scorched and burned up, and stock suffering severely for want of food and water." Catawissa, Pa., "severe drought during the entire month, streams unusually low, and nearly all wells exhausted. North branch of the Susquehanna river at this place two inches lower than established low water mark." Dyberry, Pa., 31st, "water for domestic purposes carried long distances, many wells and springs drying up." Fallston, Md., in "45 days preceding October 20th only 0.30 inches rain-fall, many springs and wells exhausted." Petersburg, Va., 26th, "mills which have been on quarter capacity for lack of water commenced running full capacity from late rains." Walnut Grove, Va., driest October for many years. West Liberty, Ohio, 31st, the whole country about suffering for want of rain. Ringgold, Ohio, 17th to 30th, severe drought. North Lewisburg, Ohio, 31st, exceedingly dry, only 0.63 inches of rain has fallen in the last 42 days. Westerville, Ohio, 31st, wells failing. Little Mountain, Ohio, "the driest October ever observed." Augusta, Ill., 21st, wells getting dry and water scarce. Springfield, Ill., 24th, all railroads leading into the city were obliged to run daily water trains on account of the drought. Wabash, Ind., "greater deficiency in the rainfall of the present month than for the month of October during the past 14 years; creeks and springs never before known to fail are dry; the greatest scarcity of water prevails in all sections of the country remote from the river, which at this place is lower than ever known before." Embarrass, Wis., 31st, brooks and rivers very low and many wells dry. Fort Madison, Ia., drought worse than last month. Prof. Nipher, of Missouri Weather Service, reports it "the driest October in 40 years; the area of smallest rain-fall extending from St. Louis to the northwest, its western boundary being the summit of the "divide" between the drainage systems of the Missouri and Mississippi rivers." Chattanooga, Tenn., 3rd, "drought is commencing to be felt." Fayette, Miss., 31st, vegetation scorched and water very scarce. Clarksville, Tex., "month has been very dry, and the earth is so parched that but little winter grain has been sown." Melissa, Tex., 2nd, drought of August and September ended. Sulphur Springs, Tex., 29th, the "long drought still continues." Coalville, Utah, 7th, "very dry, first rain since April." Winnemucca, Nev., 22nd, "Humboldt river is reported very low, and fears are entertained of a scarcity of water." Cloverdale, Cal., 31st, many places in Russian river dry.

RELATIVE HUMIDITY.

The percentages of mean Relative Humidity for the month range as follows: New England, 64 to 81; Middle Atlantic States, 66 to 80; South Atlantic States, 68 to 82; Eastern Gulf States, 72 to 82; Western Gulf States, 64 to 72; Ohio valley and Tennessee, 59 to 74; Lower Lakes, 65 to 74; Upper Lakes, 65 to 77; Upper Mississippi valley, 60 to 65; Lower Missouri valley, 59 to 65; Red River of the North valley, 61 to 75; Northern Rocky Mountain Slope, 52 to 59; Texas, 49 to 82; Southern Plateau districts, 32 to 54; California, 48 to 69; Oregon, 74 to 80. *High stations* report the following averages, not corrected for altitude: Mt. Washington, 88.3; Cheyenne, 33; Denver, 35.6; Santa Fe, 41.5; Pike's Peak, 42.7; Virginia City, 48.4.

WINDS.

Total Movements of the Air.—The following were the largest monthly movements in miles recorded at the Signal Corps stations: Pike's Peak, 16,091 miles; North Platte, 13,249; Breckenridge, 12,007; Cape Lookout, 10,626; Key West, 10,552; Portsmouth, N. C., 10,510; Cape May, 10,087; Thatcher's Island, 10,010; Sandy Hook, 9,855; Yankton, 9,657; Kittyhawk, 9,411; Punta Rasa, 9,219; Sandusky, 8,809; Indianola, 8,745; Bismarck, 8,720; Cape Hatteras, 8,543. The *smallest* movements were: Silver City, N. M., 1,148 miles; La Mesilla, N. M., 1,512; Visalia, Cal., 1,656; Lynchburg, 1,821; Roseburg, Or., 1,997; Laredo, Tex., 2,031; Fredericksburg, Tex., 2,209; Uvalde, Tex., 2,379; Shreveport, 2,511; Indianapolis, 2,495; Deadwood, 2,532; Socorro, N. M., 2,548; San Antonio, Tex., 2,637; Graham, Tex., 2,679; Brownsville, Tex., 2,773.

Local Storms.—Matronsville, Tuscola, Co., Mich., 3rd, p. m., a "cyclone" accompanied by heavy rains passed over the county fair grounds doing great damage; cloth tents were torn to shreds; fences blown down, and much other destruction committed. "Waynesborough, Ga., 10th, very destructive storm demolishing a church and uprooting many trees."

Sand-storms.—Fort Yuma, Cal., 7th, 13th, 14th, 25th, 27th; Visalia, Cal., 7th; Los Angeles, Cal., 8th; Burkes Ariz., 18th, 26th and 27th.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications for October with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of omissions to be 0.87 per cent, and of verifications to be 86.3 per cent. The percentages for the four elements have been, Weather, 91.4; Direction of the Wind, 87.0; Temperature, 86.9; Barometer, 82.5. The percentages of verifications by geographical districts, have been: New England, 85.8; Middle States, 89.5; South Atlantic States, 87.3; Eastern Gulf States, 87.9; Western Gulf States, 85.2; Lower Lake region, 88.2; Upper Lake region, 89.5; Tennessee and the Ohio valley, 88.2; Upper Mississippi valley, 84.0; Lower Missouri valley, 85.0; Northern Pacific coast region, 65.7; Central Pacific coast region, 95.2; Southern Pacific coast region, 100.0. Of the 3,780 predictions that have been made, 137, or 3.62 per cent, are considered to have entirely failed; 87, or 2.30 per cent, were one-fourth verified; 408, or 10.79 per cent, were one-half verified; 330, or 8.73 per cent, were three-fourths verified; 2,818, or 74.55 per cent, were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary Signals.—166 Cautionary Signals were displayed during the month, of which 114, or 68.7 per cent., were justified by winds of 25 miles per hour or over at, or within a radius of 100 miles of, the station. 51 Cautionary Off-shore Signals were displayed, which were all justified as to direction, and of which 44, or 86.3 per cent., were fully justified. Of the Cautionary Off-Shore Signals, 15 were changed from Cautionary. 217 Signals of both kinds were displayed, of which 158, or 72.8 per cent., were fully justified. The above does not include signals ordered at 52 display stations where the velocity is only estimated. 52 cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

In the table in the right hand side of Chart No. III are given the highest and lowest readings of the Signal Service river-gauges for the month, with the dates of the same. The rivers have continued very low throughout the entire month. The low stage of water in the Red and Ohio rivers deserve special notice. The Red River at Shreveport continued below the previous low water mark, and on the 31st had fallen to 41 inches below it, navigation continuing entirely suspended. The Arkansas at Little Rock fell on the 11th to a lower level than ever before known, and the observer reports great scarcity of water throughout that section. The Ohio at Pittsburg was 13 inches below previous low-water mark on the 19th and 20th; at Wellsboro', W. Va., near the end of the month, the river was two inches lower than known before, and at Louisville, on the end of the month, it was reported lower than before known, "there being scarcely two feet depth of water in many places, while what is known as the falls presented a bleak and barren appearance, huge rocks and stone-bed being visible for miles." At Trenton, N. J., on the 18th the Delaware river was lower than it had been for many years. The lakes are also very low, the water in Grand Traverse Bay, Lake Michigan, on the 31st being lower than for many years past, and in Sandusky Bay, Lake Erie, on the same date, lower than for twenty years past. Lake Champlain was reported on the 31st to be lower than for the last fifty years, and falling. The only high waters during the month worthy of notice occurred on the 19th and 20th in the rivers rising in the Cumberland and Blue Ridge Mountain region. The Savannah at Augusta rose to 23 feet, and the Tennessee, at Chattanooga, to 13 feet on the above dates.

High Tides.—St. Marks, Fla., 7th, five feet above the mean; Cape Lookout, N. C., 13th, 14th, 16th, 17th and 18th; Cape Hatteras, N. C., 13th and 14; Ft. Macon, N. C., 16th to 18th unusually high tides; Barnegat, N. J., 15th, unusually high; Jacksonville, Tenn., 16th, highest tide ever known on the bar at the mouth of St. Johns river; Punta Rassa, 15th; Indianola, Tex., 2nd, 3rd, 8th, 9th, 10th, 11th, 12th, 16th, 17th, 18th, 20th, 24th, 26th and 28th; Portsmouth, N. C., 12th, 14th and 16th; Cape Lookout, N. C., 13th, 15th, 16th, 17th and 18th; Eastport, Me., 16th, 17th, 20th and 21st.

TEMPERATURE OF WATER.

The Temperatures of water, as observed in rivers and harbors, with average depth at which the observations were taken, are given on Chart No. II. At the following stations no observations were made on the dates indicated:—At Augusta, from the 24th to the 31st, and at Norfolk from the 13th to the 24th, by reason of breakage of thermometer; and at Cleveland on the 19th, 23rd, 24th, and from the 28th to 31st, the lake being too rough for observations to be made. Reports are not yet to hand from Escanaba, and the Station at St. Marks, Fla., has been discontinued.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—These storms have been reported in considerable numbers during the month. They were most numerous and widespread, as follows: On the 28th they generally occurred in New England and the Middle Atlantic States. On the 10th and 11th they prevailed in the South Atlan-

tic and Gulf States; from 10th to 12th in the Upper Mississippi valley; on the 12th in the Ohio valley. In California, at Fort Yuma, on the 5th; at Calistoga on the 12th and at Princeton on the 7th and 12th. On the 15th, at Cheyenne, a heavy snow-storm, accompanied by thunder and lightning, wind NW. 44 miles.

Auroras.—But one auroral display has been extensively observed during the month. It occurred on the 7th from 7 to 10 p. m. and extended from Maine to Nebraska, being observed in the latter State at Clear Creek. Its detailed description is as follows: Cresco, Ia., 7 to 7:10 p. m., low arch in the northeast, with patches of light beneath; Monticello, Ia., at 9 p. m.; Cornish, Me., all the evening; Gardiner, Me., at 9:30 p. m., quite faint; Orono, Me., faint; Somerset, Mass., early evening, dark cloud below arch; Cambridge, Mass., 8 to 8:45 p. m.; Waltham, Mass., 7:20 to 8 p. m., faint nebulous haze; Newburyport, 7 to 10 p. m., faint above a dark segment; Clear Creek, Neb., faint; Contoocookville, N. H., 7:30 p. m., diffuse light; Grafton, N. H., 8:30 to 9:30 p. m., not very bright; Argyle, N. Y., slight diffuse light in the early part of the evening; Woodstock, Vt., 8 p. m., slight nebulous light; Newport, Vt., faint; St. Paul, 7:40 p. m., faint light and arch. Eastport, Me., 7:30 p. m., arch extended from NE. to NW. and consisting of two brilliant unbroken bands reaching 30° towards the zenith. Streamers were observed to play between the bands several times extending from one to the other. General cloudiness prevailed throughout the Lake region during that evening, which prevented observations of the display. The following isolated cases of aurora are reported. 6th, Starkey, N. Y. 9th, Arlington, Ind., 9 p. m.; New Corydon, Ind. 10th, Oregon, Mo., at 9 p. m.; Port Huron, 11th, Oregon, Mo., at 9 p. m. 17th, Vevay, Ind. 18th, Arlington, Ind., 10 p. m. 19th, Detroit, 8 p. m., quite feeble; Wellsborough, Pa. 22nd, Ft. Wayne, Ind. 24th, Wellsborough, Pa. 25th, Woodstock, Vt. 26th, Woodstock, Vt. 27th, Starkey, N. Y. 28th, New Corydon, Ind., corona appeared at 8 p. m., disappearing shortly after. Arlington, Ind. 31st, Starkey, N. Y.

Telegraphic Communication Interfered with by Atmospheric Electricity.—Santa Fé, 12th, 13th; Jacksboro, Texas, 2nd, 3rd, 5th, 10th; Fort Davis, Texas, 5th; Castroville, Texas, 3rd, 8th, 12th, 16th; Eagle Pass, Texas, 1st, 10th, Edinburg, Texas, 1st; Pembina, 1st, 11th.

OPTICAL PHENOMENA.

Solar Halos were seen in greatest numbers from the 25th to 27th, twelve on the latter date, extending from Maine westward, to Minnesota, and as far south as Virginia; but few were reported from the Gulf States.

Lunar Halos were frequently observed east of the Rocky Mountains from the 22nd to the 31st; there being no state from which one or more has not been reported.

MISCELLANEOUS PHENOMENA.

Prairie and Forest Fires.—Ft. Gibson, 14th, 17th, 19th to 23rd, 28th to 31st; Ft. Sill, 7th, 8th, 13th to 20th, 26th to 29th; Springfield, Mass., 14th 15th; Creswell, Kan., 17th to 19th, 24th to 29th; Enfield, N. H., 15th to 17th; Ft. Dodge, Iowa, 2nd 3rd, 6th, 8th, 10th, 13th, 14th, 15th; Litchfield, Mich., 1st to 18th; Mt. Solon, Va., 29th to 31st; Walnut Grove, Va., 16th; Camp Sheridan, Neb., 3rd, 4th, 5th; Ft. Randall, Dak., 5th, 8th, 9th; Ft. Hale, Dak., 5th; Mt. Vernon, Iowa, 2nd, 3d; Red Bluff, Cal., 25th to 31st, in mountains; Los Angeles, Cal., 25th; Virginia City, 5th, very extensive in Ruby Valley; Yankton, 1st, 8th, 9th, 10th, 20th; Ft. Stevenson, Dak., 5th; Deadwood, 5th, 6th, 7th 13th; North Platte, 9th, 18th, 20; Henrietta, Tex., 29th, 30th; Coleman, Texas, 19th, 20th; Pembina, 1st to 5th, 6th, 16th, to 24th; Burlington, Vt., 3rd, 4th, 13th, to 25th; In Vermont, between Camel's Hump and Mansfield Mount ains on 16th, forest fires destroyed large tracts of valuable timber; also near Plymouth, Windsor, county, large areas burned over and much lumber destroyed. Port Jervis, N. Y., 16th, in mountains. Waterbury, Vt., 14th, immense damage inflicted. Brentwood, Long Island, 16th to 18th. Weymouth, Norfolk county, Mass., 28th, over 100 acres of woodland burned. Wellsborough, Pa., during portions of the month severe forest fires have raged through the county, doing much damage; Brockville, Ont., 15th, severe bush fires raging near Westport; over 400 acres burned; other fires were reported in various parts of that and adjacent counties. Lebanon, N. H., 15th, on Grant-ham Mountain, doing great damage to valuable timber; hundreds of acres burned over. Northampton, Mass., 15th, "a severe fire has been raging in the woods north of that place during the past two days. The whole western part of the State is enveloped in dense smoke from forest fires." Concord, N. H., 15th, a large territory of woodland burned over; over two thousand cords of wood destroyed for one firm. Pembina, 1st to 7th, very extensive prairie fires doing much damage. Norfolk, N. Y., 3d forest fires raged fear fully, "destroying farm houses, barns and farm property. Some of the roads are impassable" whitestone, Long Island, 16th, "during past twenty-four hours dense clouds of smoke, from forest fires, rendered it necessary to keep the fog bells tolling from Ft. Schuyler to Executive Lights." Sparta, N. Y., 17th, large forest fires raging, destroying valuable timber, fences and orchards. Montreal, Can., 17th, "dense smoke on the river still continues and navigation is entirely suspended." Sweetwater Valley, San Diego Co., Cal., 28th, one of the greatest conflagrations "ever known to the oldest inhabitant, from 40 to 50 square miles of territory burned over."

Meteors have been seen in considerable numbers throughout the country east of the Mississippi valley, the largest number of stations reporting them as visible on the 12th and 13th. None of particular import-

ance were observed, except at Indianola on the 12th, 10:20 p. m. A very brilliant meteor started in the vicinity of Aquarius, about 25° above the horizon and moved southward. Apparent size one-fourth of the full moon, color white. When about 10° above the horizon it exploded into seven fragments, lighting up the whole southern sky as though the full moon had been present.

Earthquakes.—June 3rd, 9:32 a. m., on Atka Island, Alaska, eight sharp shocks in rapid succession, lasting about two seconds each, movement from SSE. to NNW. October 2nd, a sharp shock of earthquake was felt at 6:30 a. m. at Oakland and other places around San Francisco bay. Winsborough, S. C., 26th, a. m., slight shock. New Haven, Conn., 24th, 6.12 to 6.13 p. m., two slight shocks at intervals of 2 or 3 seconds. The shocks were felt at Bridgeport, 15 miles distant, at about the same time.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather, for the succeeding twenty-four hours, have been observed at all Signal Corps stations. Reports from 134 stations show 4,087 observations to have been made, of which 29 were reported doubtful; of the remainder 3,532, or 87.0 per cent were followed by the expected weather.

Grasshoppers.—Dayton, W. T., 1st, doing some injury to fruit and laying many eggs; October 4th, large numbers reported as appearing in Stephen's Co., Texas; Pilot Point, Tex., 17th, in large numbers, passing over station from the northwest, few alighting; 19th, disappeared; 20th, reappeared but did no damage; 21st, large wheat fields were reported destroyed 15 miles southeast of station; disappearing afterwards to the southward without depositing eggs; Jacksboro, Tex., 17th and 18th, flying south; Coleman, Tex., 17th, passing southward, very few alighting; Fredricksburg, Tex., 19th, passed southwards near station, none alighting. Ft. Sill, I. T., 28th, disappearing, very few to be seen; Melissa, Tex., 18th, myriads passing over station; 17th, Dallas, Tex., moving south in clouds, very few alighted, reported thick in counties to the west and northwest, "no damage done as yet"; Waco, Tex., "passing over city all day, and twelve miles west have appeared in myriads"; 19th, reported to be damaging wheat near Staunton, Ill.; early part of October in Parker Co., Tex., doing some damage; Shackelford Co., southern portion, "in innumerable numbers"; Erath Co., Tex., many passed "over," few alighted but did little damage; Denison, Tex., 21st, large swarms passed over station to the southwest, continuing until 3 p. m. of the 22nd; San Antonio, Tex., 24th, many passed over station to the southeast, but no destruction was heard of; Bosque Co., Tex., 25th, very plentiful, "the new wheat crop has been entirely eaten up by them."

Geese flying south at Hulmesville, Pa., 11; Visalia, Cal., 9th, 25th; Red Bluff, Cal., 3rd; Roseburg, Or., 6th, 11th; Yankton, 7th, 26th; North Platte, 30th, 21st; Bismarck, 2nd, 14th, 21st; Pilot Point, Tex., 22nd; Uvalde, Tex., 14th; Jacksboro, Tex., 22nd; Henrietta, Tex., 28th, 30th; Graham, Tex., 24th; Little Rock, Ark., 17th; Pembina, 21st, 22nd; St. Louis, 24th; Duluth, 19th, 27th.

Polar Bands.—Gardiner, Me., 26th; Freehold, N. J., 29th; Wytheville, Va., 24th; Tabor, Iowa, 1st, 2nd; Pembina, 13th, 18th, 25th; Leavenworth, 21st, 30th.

Mirage.—Olivet, Dak., 21st, 26th, 31st.

Zodiacal Light.—Pike's Peak, 24th, 5:54 P. M., a rosy yellowish light of conical shape.

Sun Spots.—The following record of observations made by D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, U. S. Navy, Superintendent Nautical Almanac, Washington, D. C.:

DATE— SEPT., 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
1st, 3 p. m...	0	0	0	0	0	0	1	1	Spot much smaller.
2nd, 4 p. m...	1	9	0	0	0	0	1	9	
3rd, 4 p. m...	0	0	0	0	0	0	1	1	Faculae.
5th, 5 p. m...	0	0	0	0	0	0	0	0	Faculae.
7th, 4 p. m...	1	4	0	0	1	4	1	4	Faculae.
8th, 5 p. m...	0	12	0	0	0	0	1	12	
10th, 4 p. m...	0	0	0	0	0	0	1	13	
12th, 5 p. m...	1	4	0	0	0	0	2	17	
13th, 8 a. m...	1	4	0	4	1	4	3	17	Faculae.
13th, 4 p. m...	0	0	0	0	0	0	3	16	Faculae.
14th, 4 p. m...	0	0	0	0	0	0	3	7	Faculae.
14th, 9 a. m...	0	0	1	2	0	0	1	3	
19th, 5 p. m...	1	17	0	0	0	0	1	17	
19th, 5 p. m...	0	0	0	0	0	0	1	17	
20th, 1 p. m...	0	0	0	0	0	0	1	11	
23rd, 8 a. m...	0	0	1	11	0	0	0	0	Spots probably disappeared by solar rotation.
30th, 8 a. m...	0	0	0	0	0	0	0	0	{ Faculae.
31st, 8 a. m...	0	0	0	0	0	0	0	0	

Observations were also made on the 6th and 16th at 4 p. m., on the 24th, 25th, 26th and 28th at 8, 9, 10 and 7 a. m. respectively, and on the 31st at 5 p. m., but no spots were seen. Mr. David Trowbridge, at Waterbury, N. Y., observed the sun on the 2nd, 3rd, 4th, 5th, 6th, 7th, 9th, 11th, 12th, 14th, 16th, 23rd, 24th, 25th, 26th, 29th and 30th, but saw no spots on those days. On the 19th, at 3.30 p. m., saw two groups near the west margin of the disk; one contained 2 spots and the other 3. These groups and spots were also seen on the 20th and 21st. They disappeared by rotation, presumably by the 22nd. Mr. H. D. Gowey, at North Lewisburg, Ohio, observed three large spots on the 18th, at 7.50 a. m., in the southeast quadrant.

Prof. F. Hess at Fort Dodge, Iowa, reports the following spots: 8th, 10 a. m., 3 spots in SE. quadrant;

10th, 8:30 a. m., 9 in SE. quadrant; 12th, 11 a. m., 1 in SE. quadrant; 13th, 7 a. m., 5 spots—1 in SE quadrant and 4 in NW. quadrant; 14th, 3 spots; 15th, 7 a. m., 2 in SE. quadrant; 18th, 9 a. m., 3 in NW quadrant; 19th, 4 in SW. quadrant; 20th, 5 in SW. quadrant; 22nd, 3 in SW. quadrant. No observations were made on the 9th and 11th; on the 16th and 17th the sun was hidden; on the other days of the month, observations were made but no spots seen. Prof. Hess says: "The sun spot observations were of unusual interest. At least one of the spots mentioned, namely, that observed on the 12th alone, and on the 13th, together with 4 others, and, perhaps, also some of the group of 9 spots observed on the 10th, did not disappear by solar rotation, but seemed to fade away long before they would have disappeared by rotation." Mr. William Dawson, Spiceland, Ind., noticed the following spots: 7th, one group of 4 large spots, faculae very prominent, clouds prevented good observations; 8th, fine group of 14 spots near east edge, faculae very beautiful; 9th, 25 spots in the group, 6 very prominent; 10th, 25 spots, one group, one spot quite large with penumbra; 11th, 20 spots, the large one having divided into 3; 12th, only 10 spots in the late group, and all small but one, another group of 8 small spots in SW. quadrant, 2 spots and faculae at east edge; 13th, 30 spots in three groups, 10 spots in the waning group near centre, 14 spots in SW. group and 6 spots in new group at east edge; 14th, 20 spots in four groups, new group at SW. margin; 18th, 13 spots in one group in NW. quadrant, 3 large; 20th, 25 spots in two condensed groups near together, about 3' from west edge. No spots from 22nd to 31st, inclusive.

Prof. Gustavus Hinrichs, of Iowa City, Iowa, says: "A group of sun spots, comprising two very large spots, traversed the sun's disk between the 14th and 21st.

Observations were also made throughout the month at Fort Whipple, Va., but no spots were seen.

NOTES AND EXTRACTS.

Alexander Buchan, in *Nature*, October 22nd, 1879, briefly discusses the Greenwich Meteorological Observations from 1854 to 1873. He says: "There can be no doubt that in these twenty years' average we have the closest approximation to the mean monthly diurnal inequality of the barometer, in other words, to one of the prime factors of the meteorology of Greenwich. Of special interest are the results for the warmer months of the year, which class Greenwich among the places in middle and higher latitudes, whose climates are more or less continental in their character—these more special features being the occurrence of the forenoon maximum as early as 9 a. m., and a marked diminution in the amount and amplitude of the morning minimum. The almost strictly local character of the diurnal phases of atmospheric pressure, as disclosed by the observations at Greenwich, is seen from the occurrence of the a. m. maximum an hour earlier at Kew, where also the a. m. minimum becomes still less pronounced than that of Greenwich. On the other hand, at Falmouth, the a. m. minimum is much the greater of the two daily minima, and the a. m. maximum is delayed from two to three hours later than at Greenwich. Hence the true value of the Greenwich results can only be appreciated after a comparison has been made between them and the results obtained from other meteorological observatories."

"The observations of temperature are discussed with particular fulness, and the length of time is sufficient to give curves showing a diurnal inequality of temperature such as will substantially represent the curves for large portions of the south of England, not bordering the sea, where the thermometers are similarly placed to those at Greenwich."

"The curves of temperature for the different winds have also been worked out with much elaboration, and give most interesting results."

"On the average of all the months the N. wind is the coldest, the S. W. the warmest; the order as regards temperature, beginning with the coldest, is N., NE., NW., E., SE., W., S., SW.—an order, however, which differs in different months."

"In a large number of years the third barometric maximum, first noted by Rikatscheff as occurring in certain regions of the globe a little after midnight, appears in the Greenwich diurnal curves for December, January and February, less frequently in March, and seldom or not at all in the other months. The somewhat rough method which has been adopted in reducing the barometric observations to 32° unfortunately renders the evidence furnished by the Greenwich results regarding the more refined inquiries of meteorology, such as this, and the mean diurnal inequality of the barometer in the lunar months, not so satisfactory and conclusive as might have been wished."

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Albert J. Myer

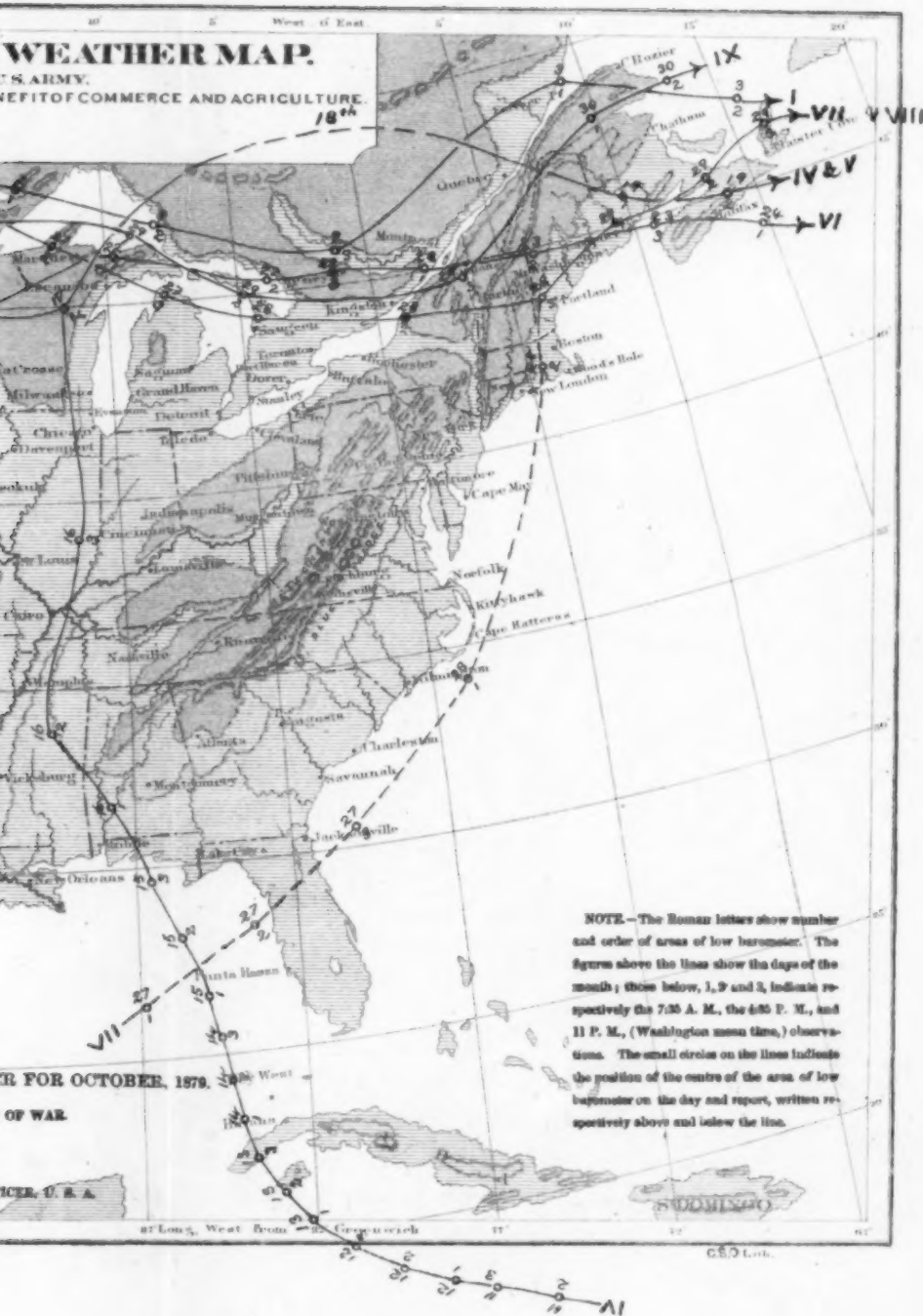
Brig. Gen. (Bvt. Assg^d.) Chief Signal Officer, U. S. A.

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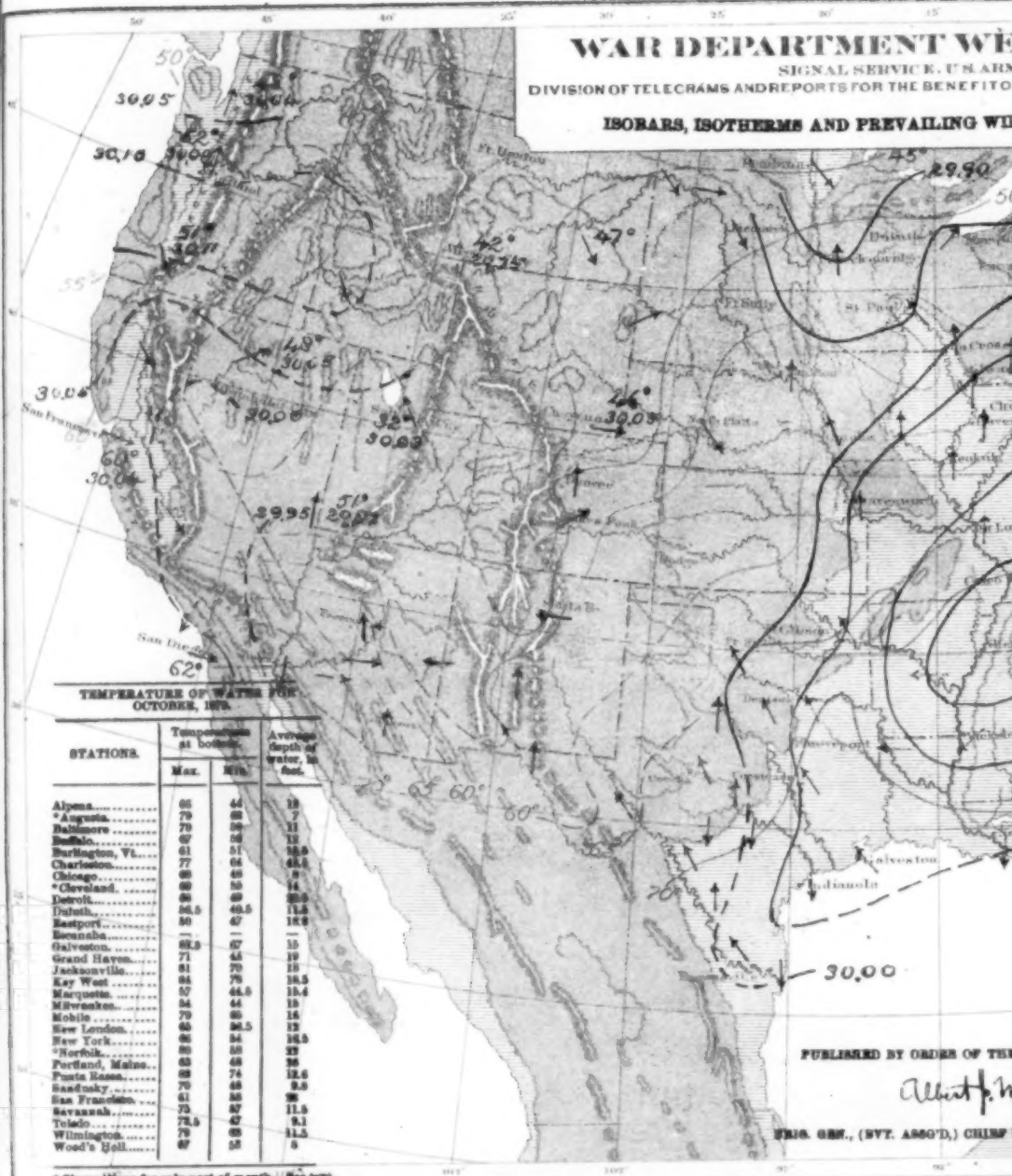


No. I.



WAR DEPARTMENT
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ISOBARS, ISOTHERMS AND PREVAILING WINDS

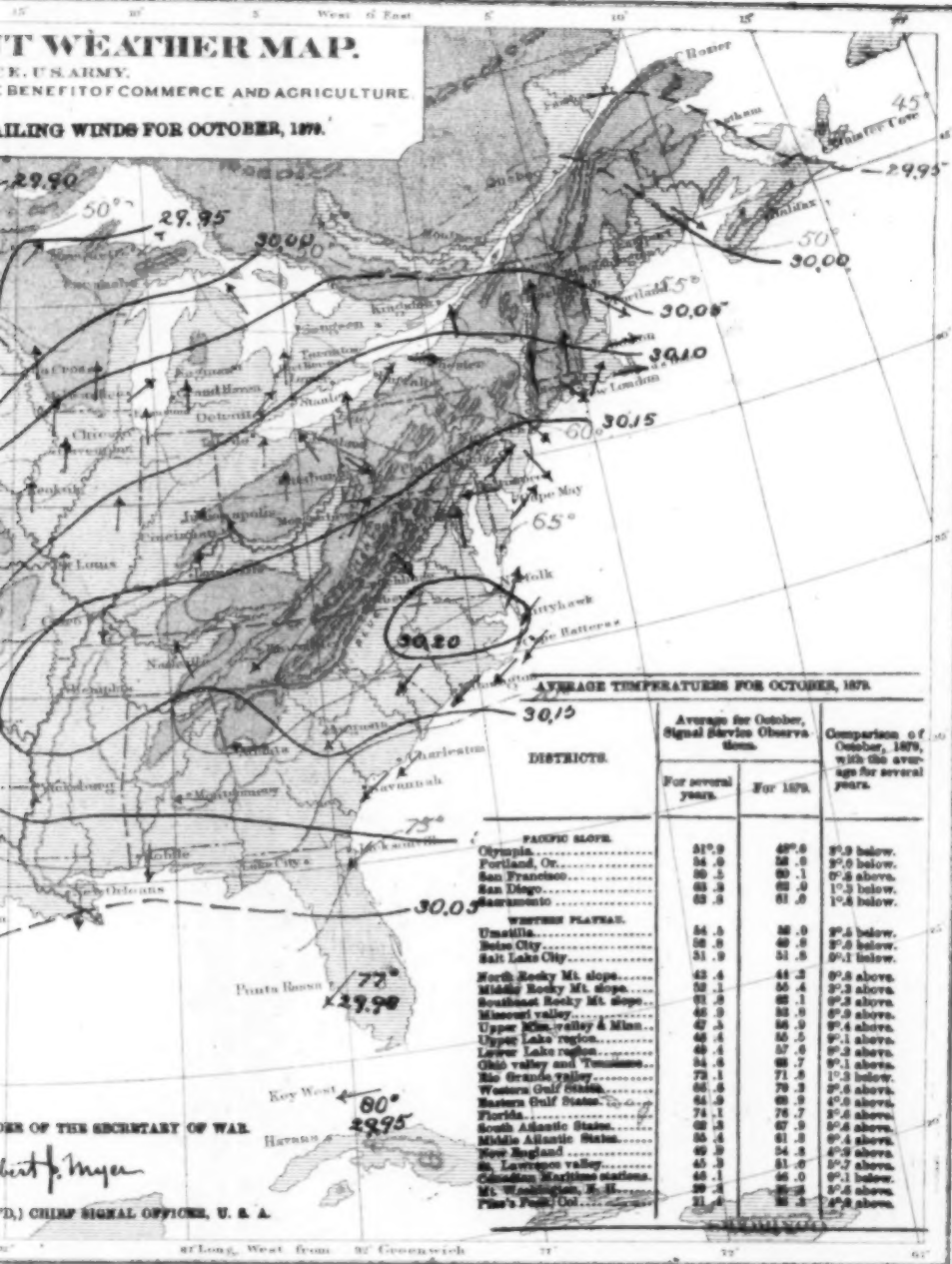


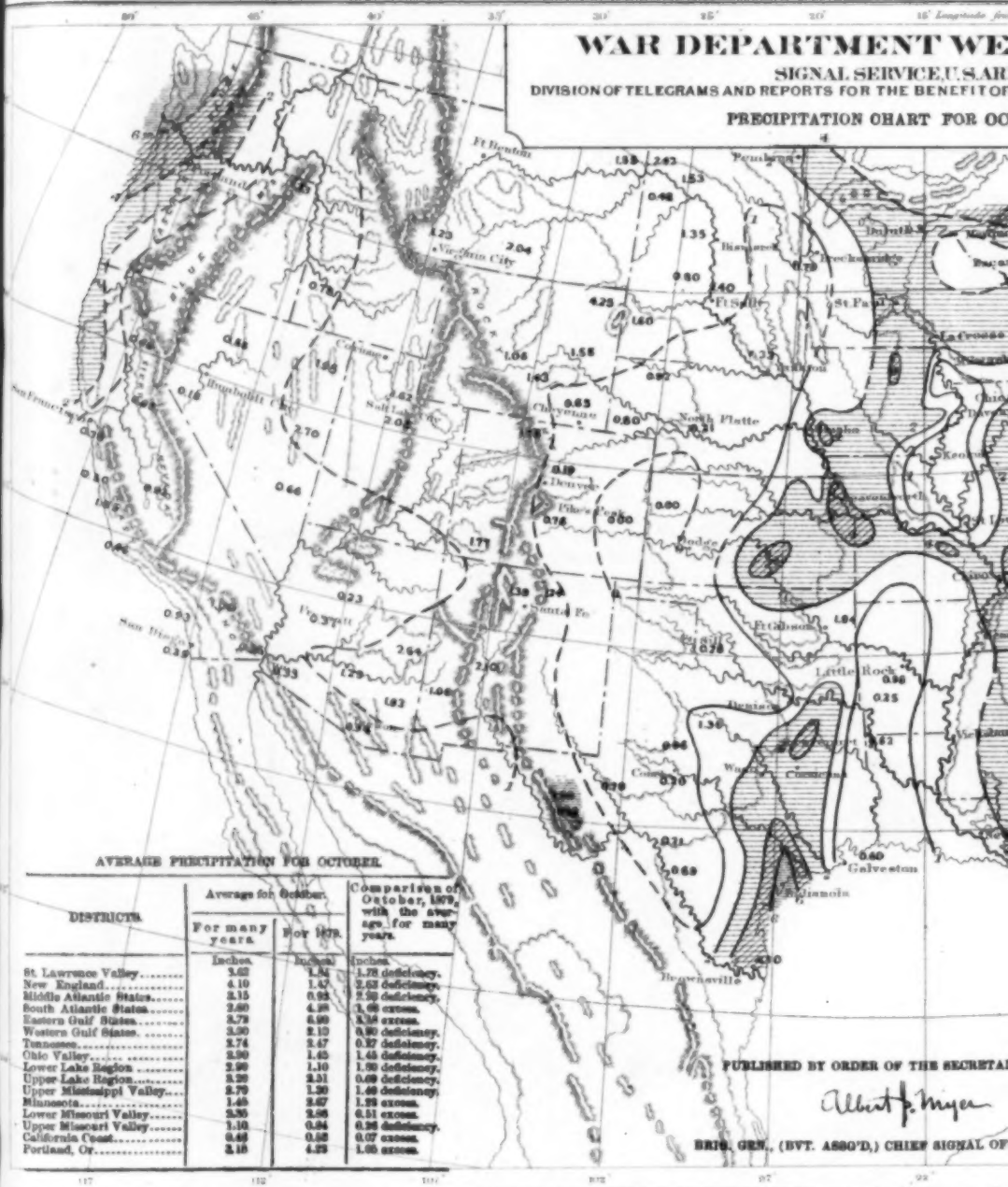
* Observations for only part of month—See text.

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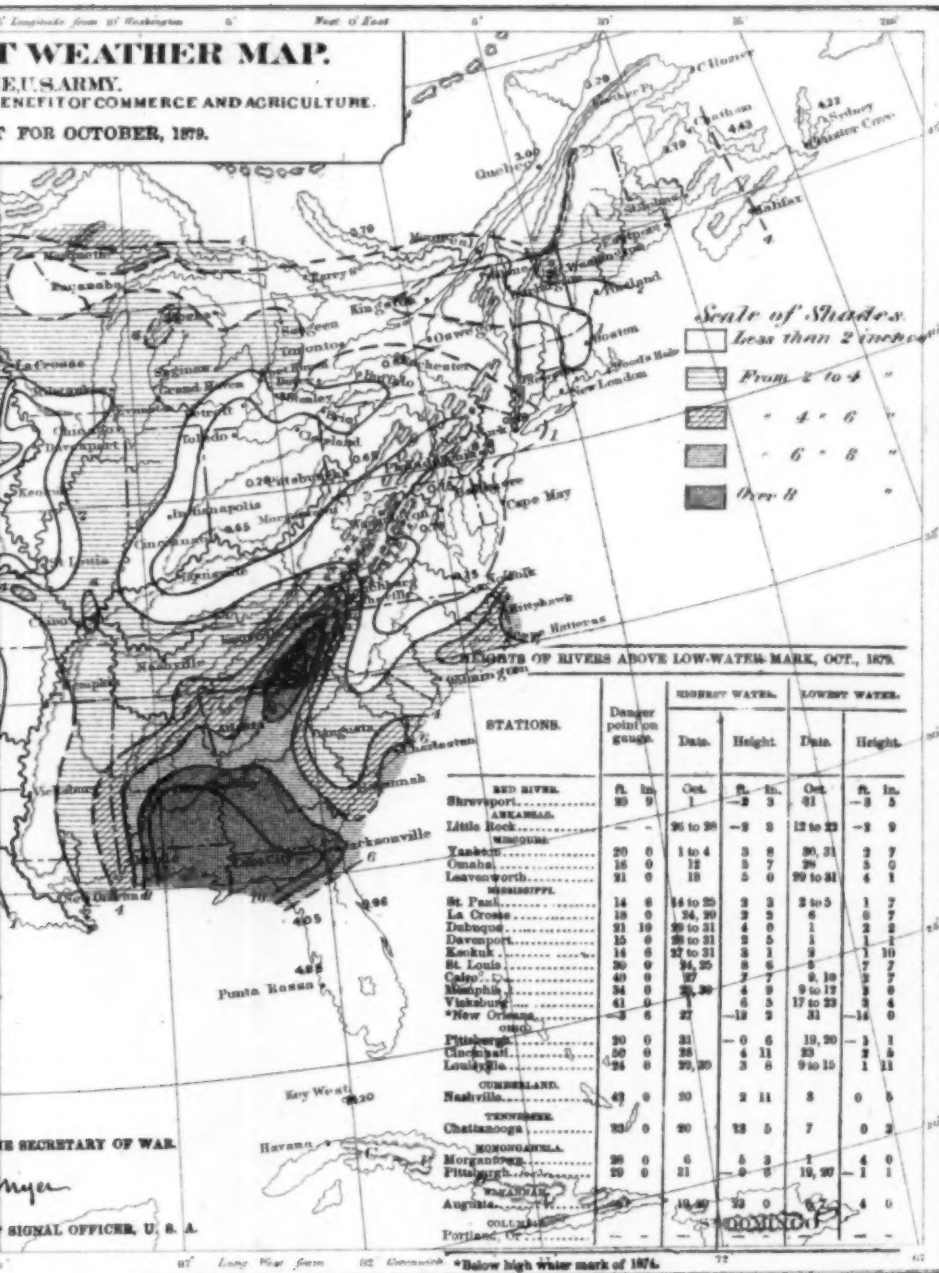
Albert P. M.

THIS GIVE., (WVT. ASS'D.) CHIEF





No. III.



WINDS ACCOMPANYING THE ATLANTIC STORMS

European Coast.

No.	DATE.	Wind.		Days.	Winds per hour.	
		Direction.	Force.		Force.	Force.
I.	August 20.	—	—	Sept. 13.	—	—
II.	Sept. 2.	W	25	Sept. 18.	W	15.6
VI.	Sept. 25.	W	25	Sept. 27.	W	11.2

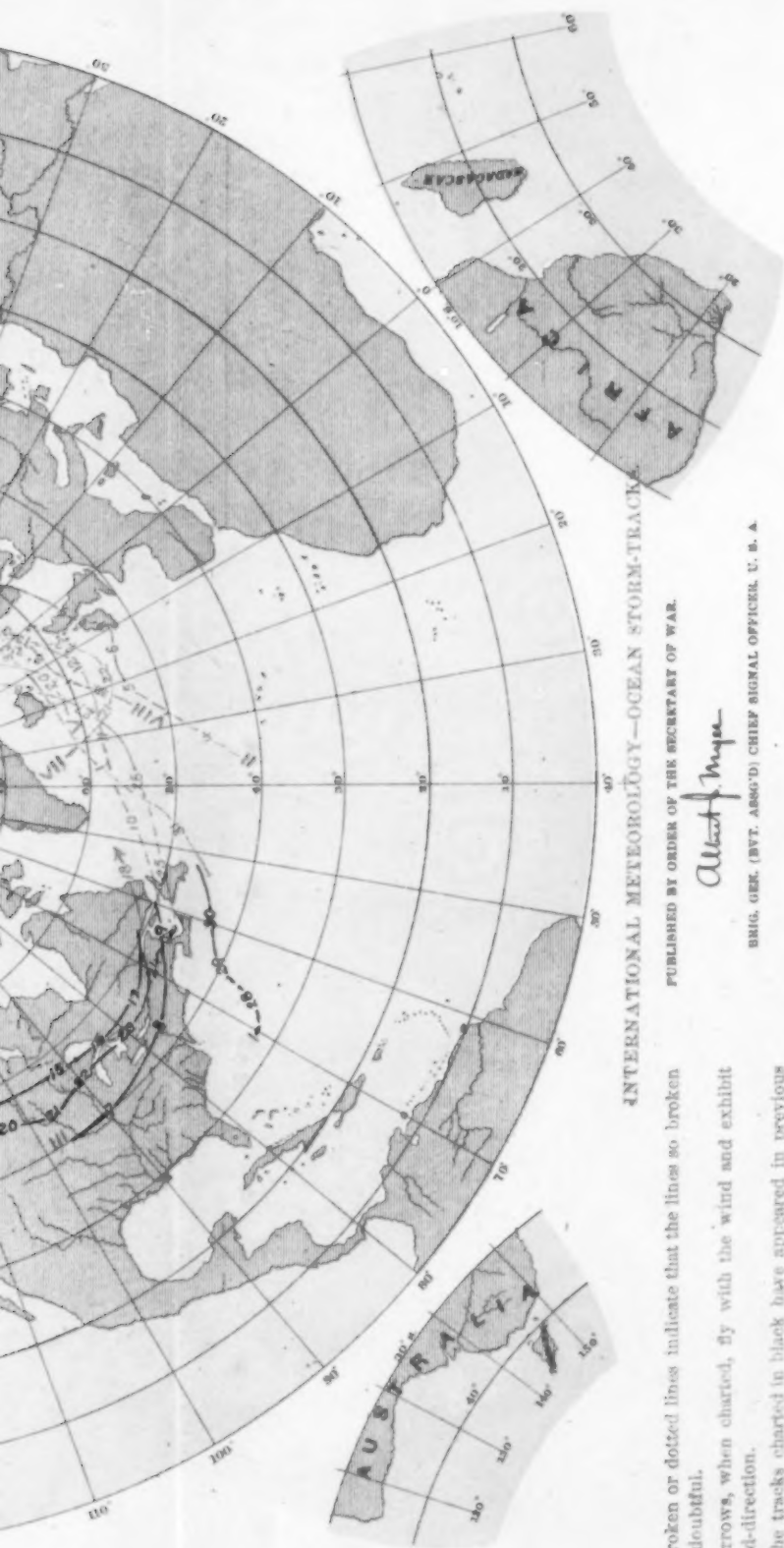
* Estimated from a scale of 9 to 6.

INDEX TO STORM-TRACKS

- Atlantic Ocean.
- No. I. from Aug. 20 to Sept. 13, 1879.
 - II. from Sept. 13 to Sept. 18, 1879.
 - III. from Sept. 18 to Sept. 27, 1879.
 - IV. from Sept. 27 to Oct. 1, 1879.
 - V. from Oct. 1 to Oct. 13, 1879.
 - VI. from Oct. 13 to Oct. 25, 1879.
 - VII. from Oct. 25 to Oct. 27, 1879.
 - VIII. from Oct. 27 to Oct. 28, 1879.

- Pacific Ocean.
- No. I. from June 13 to June 18, 1879.





INTERNATIONAL METEOROLOGY—OCEAN STORM-TRACK

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Alfred Meyer

BRIG. GEN. (RET. ARMY) CHIEF SIGNAL OFFICER, U. S. A.

Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction.

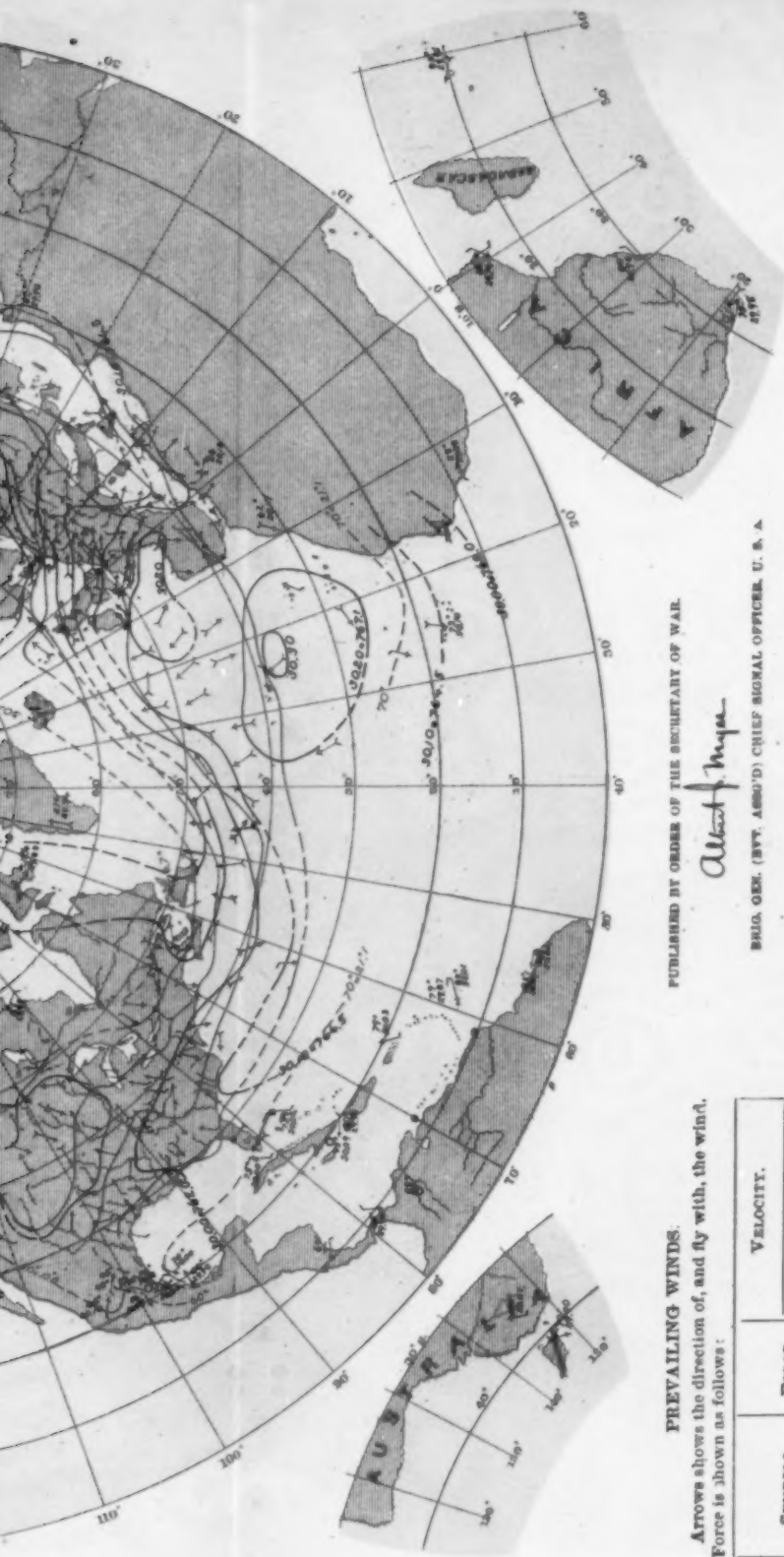
The tracks charted in black have appeared in previous *Reviews*.

The tracks charted in red have been made from data collected since preceding *Reviews*.

INTERNATIONAL MONTHLY CHART.
 Showing mean pressure, mean temperature, mean force and prevailing direction of winds at
 7:35 A. M., Washington mean time, for the month of March, 1878, based
 on the daily charts of the International Bulletin.

No. V.





PREVAILING WINDS.

Arrows shows the direction of, and fly with, the wind.
Force is shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
↑	1, 2	0 to 9	0 to 4.0
↑↑	3, 4	9.1 to 22.5	4.1 to 10.1
↑↑↑	5, 6	22.6 to 40.5	10.1 to 18.1
↑↑↑↑	7, 8	40.6 to 67.5	18.1 to 30.2
↑↑↑↑↑	9, 10	67.6 up	30.3 & over.

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Atchafalaya

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ISOBARS AND ISOTHERMS.

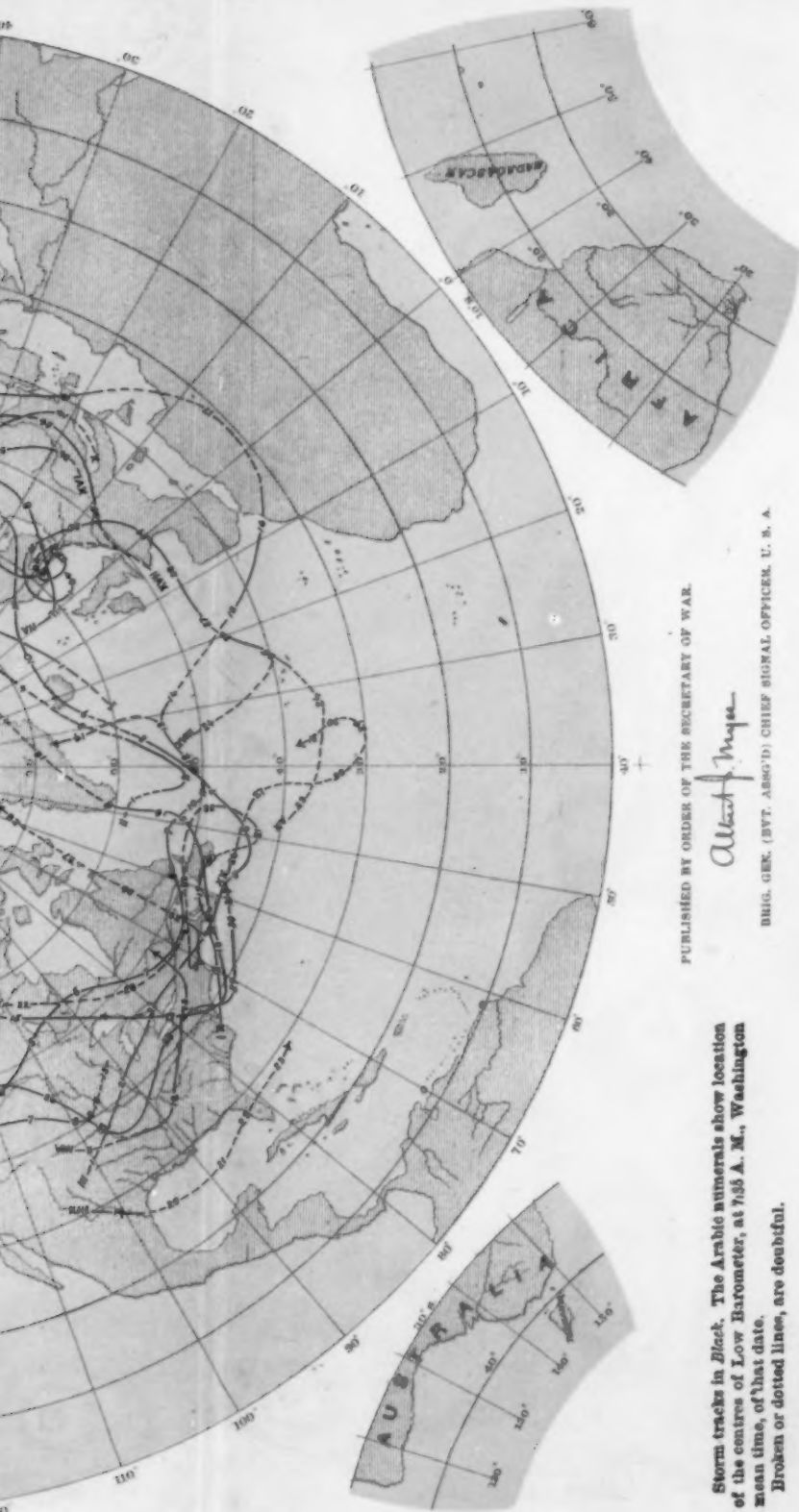
Isobars in blue; detached barometer means in English inches.

Isotherms in red; detached temperature means in degrees Fahrenheit.

No. VI.

INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for
March, 1878.





Storm tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

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A. H. Meyer

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